The MINING CONGRESS JOURNAL

Volume 13 FEBRUARY, 1927 *No.* 2

IN THIS ISSUE

Contributors:

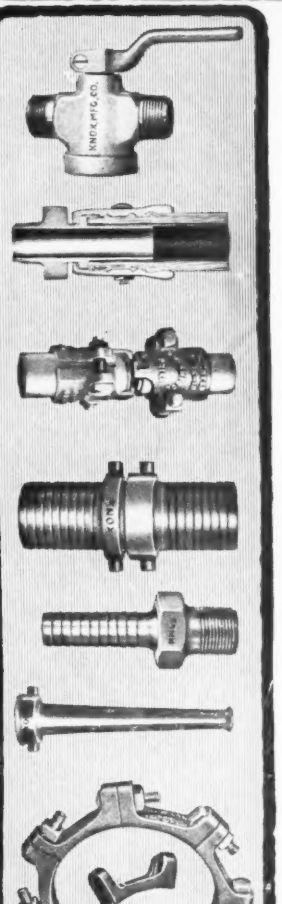
Hon. F. W. Mondell, W. Halverson Farr, A. G. Mackenzie, Nathan B. Williams, Charles L. Gilmore, Josiah Keely, Ernest Gayford, Vincent L. Denunzio, Charles H. Matthews.

KNOX

Valves-Couplings-Nipples-Clamps-Menders

MINING SPECIALTIES

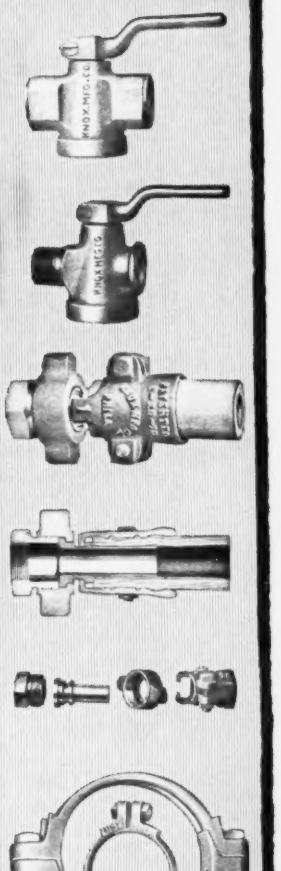
The World's Standard



OUR PURCHASING AGENT

considers himself *your assistant* and in buying the raw materials which enter into the manufacture of Knox Products, he endeavors to exercise the same care that *you* would use.

He has an eye to price, quality, delivery, serviceableness, and the general satisfaction which will be enjoyed by—may we say, the parent companies of Knox?



KNOX MANUFACTURING CO.

INCORPORATED 1911

817 Cherry St. Philadelphia, Pa.

THE MINING CONGRESS JOURNAL

FEBRUARY, 1927

CONTENTS

$3.00 Per Year
30c Per Copy

EDITORIALS

FEATURE ARTICLES

DEPARTMENTS

NEWS

PRACTICAL OPERATING MEN'S DEPARTMENT

METALS

Evolution of Milling Methods at the Utah-Apex Mine

Bingham, Utah, 1909-1926

COAL

The First Slope Mine In Harlan County, Kentucky

Permissible Electrical Equipment For Gaseous Mines

Coal Washing at Bellingham Mines

Published Every Month by the American Mining Congress, Washington, D. C.

JAMES F. CALLBREATH
Editor-in-Chief

E. R. COOMBES
Editor

MCKINLEY W. KRIEGH
Assistant Editor

GUY N. BJORGE
Associate Editor

NEWELL G. ALFORD
Associate Editor

ERNEST H. PULLMAN
Legislative Editor

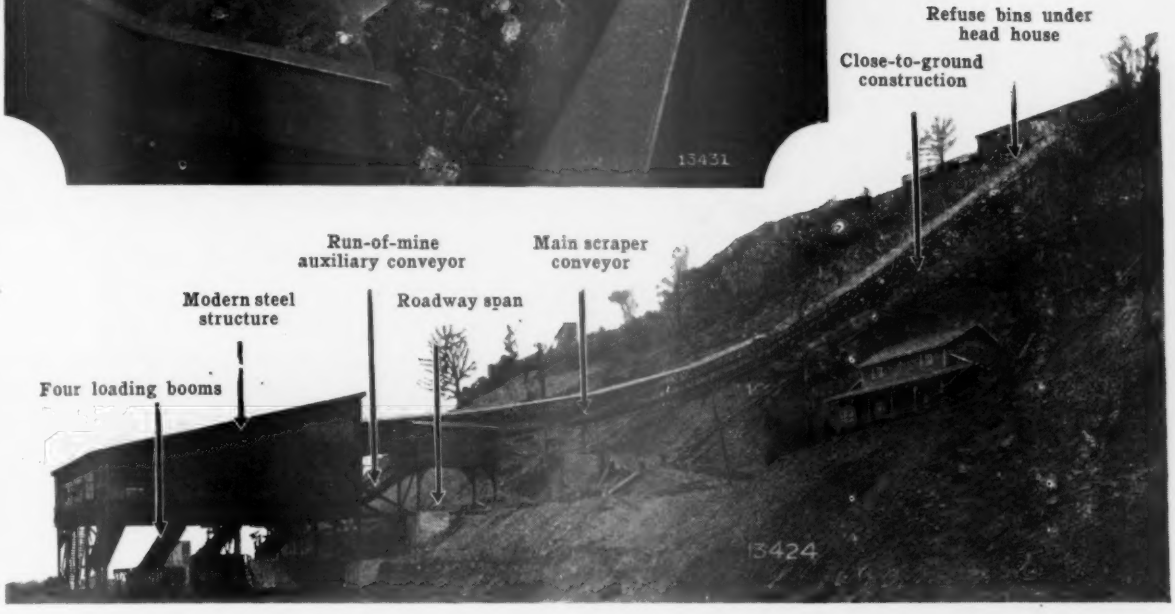
BURTON BUNCH
Circulation Manager

F. E. PRIOR
Art Editor

J. R. HURLBURT
Field Representative

Entered as Second Class Mail Matter January 30, 1915, at the Post Office at Washington, D. C.

Slack free coal on picking table in head house



All Steel 1500 Ton Tipple

Fifteen hundred tons of No. 3 Pocahontas go over this tipple every day at the Arlington Coal and Coke Company's Mine in West Virginia.

At the head house the slack is screened out ahead of the picking table, making clean picking easy.

This slack is put back with the clean coal on the main scraper conveyor.

In the screen house below, four loading booms deliver lump, egg, nut, run-of-mine or any mixture.

These adjustable booms swing low enough to deposit the coal into the cars unbroken.

Write your nearest Jeffrey Sales Office for information on Tipples and Coal Mining Machinery.

The Jeffrey Mfg. Co., 958-99 North Fourth St., Columbus, Ohio

New York, Philadelphia — Pittsburgh, Scranton, Pa. — Cleveland, Cincinnati — Charleston, W. Va., Chicago — Denver, Salt Lake City — St. Louis, Birmingham — Montreal Canada

JEFFREY
COAL MINE EQUIPMENT

Jeffrey-Standard Coal Mine Equipment

Coal Cutters
Combination Cutter and Loader
Drills
Conveyor-Loader
Sectional Conveyor
Pit Car Loaders
Locomotives
Mine Fans
Tipple Equipment
Crushers

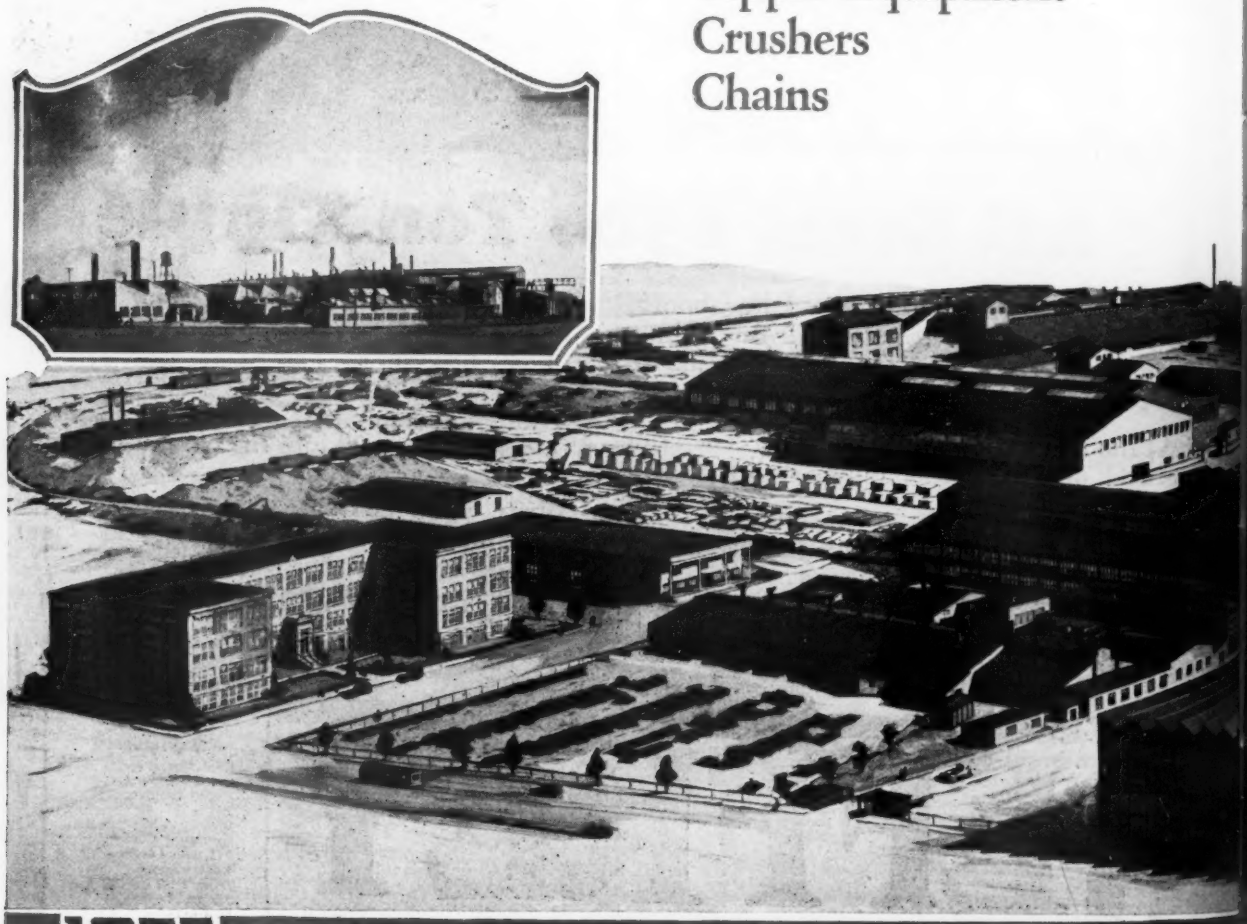
Now in Its 50th Year o

The small workshop shown above represented the Jeffrey Manufacturing Company half a century ago.

The present plant, as shown below, together with its malleable foundry, in the panel, covers more than 60 acres of ground.

Complete Jeffrey Equipment for the Coal Mine—

Coal Cutters
Drills
Loaders
Conveyors
Locomotives
Fans
Tipple Equipment
Crushers
Chains



1877

Service to Industry

IN 1877, annual bituminous coal production was only thirty-five million tons. Coal cutting was laborious, slow and costly.

In that same year the Jeffrey Manufacturing Company began the manufacture of the first practical coal cutter—a machine that revolutionized the mining industry.

With the introduction of the Jeffrey coal cutter, production increased rapidly until today nearly six hundred million tons of bituminous coal are produced annually.

Economic necessity demanded that steel and electricity be substituted for bone and muscle, and Jeffrey's progressive pioneering furnished the equipment.

Now practically every coal mining operation is met by Jeffrey cutting, drilling, loading, conveying, hauling, cleaning, grading and ventilating equipment.

The latest Jeffrey Contributions to mining progress are the Shortwa-loader, Sectional Conveyor, and Conveyor-Loader.

The Jeffrey Manufacturing Company

958-99 North Fourth St., Columbus, Ohio

Branch Offices

New York Philadelphia
Pittsburgh Denver
Scranton, Pa. Chicago
Birmingham Montreal
Charleston, W. Va.
Salt Lake City

Sales and Service Stations

Pittsburgh Terre Haute
Salt Lake City
Winchester, Ky.
Birmingham

1927

Du Pont Gelatin Helps

New type explosive developed by du Pont used exclusively in the Great Northern Railway's Cascade Tunnel, at Scenic, Washington

IN the construction of the longest tunnel in the United States and the fifth longest tunnel in the world, du Pont Gelatin Dynamite was used exclusively.

What does that mean to you?

Of all explosives, du Pont Gelatin has the greatest range of *adaptability* to all purposes and conditions, the greatest all-around *safety*, the greatest *disruptive force*, and the highest *resistance to water*. The adjoining panel tells why.

More research work has been done on du Pont Gelatin than on almost any other type. Year after year, practical blasters and laboratory chemists worked together to perfect a safer, more adaptable, more powerful explosive. Formula after formula, dozens of them, were tried out and rejected until the present "balanced" formulas were arrived at. BALANCED because *maximum strength* is balanced with *minimum fumes*. No other explosive compares with du Pont Gelatin for tunnel and mine work where ventilation is not of the best. In the Shandaken Tunnel, where du Pont Gelatin was used, no complaint about fumes was ever made. At present, du Pont Gelatin is made in a variety of strengths from 20% up to 60%, 75%, 80%, 90% and 100%—each strength always uniform, unvarying, eliminating any guesswork and hazardous uncertainties.

With one exception, du Pont Gelatin is being used in the driving of every important tunnel in the United States where du Pont has distributing facilities.

DU PONT

GELATIN DYNAMITES

Greater Range of Adaptability

Du Pont makes a larger range of specialized explosives—the best for certain definite kinds of work. Du Pont also makes one type of explosive with a greater range of adaptability to the job and its conditions than any other type of high explosive—DU PONT GELATIN DYNAMITES.

Balanced Formulas — maximum strength with a minimum of fumes. Sensitive enough to be entirely exploded but not unduly sensitive to rough handling — no possibility of unexploded charges.

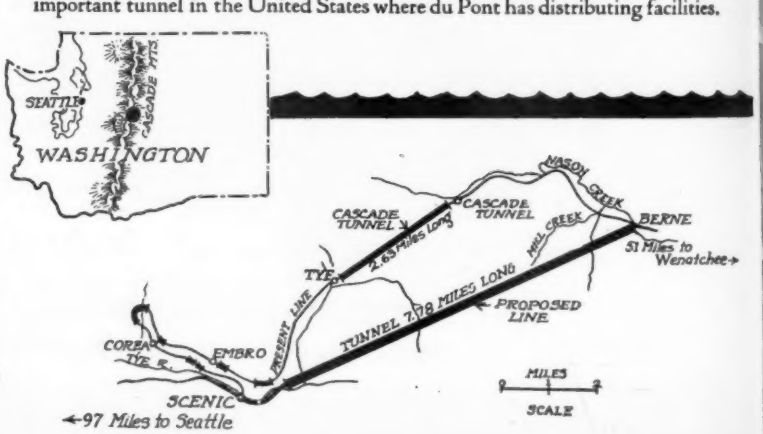
Water Resistant — not affected by water. The only explosive for submarine work, in tunneling and mining where water gushes from the bore holes, and in shaft sinking where water pours down on the workmen.

Plasticity — can be loaded in "uppers." Du Pont Gelatin stays where it is *put*. No other type of explosive can hold in such holes.

Safest Fumes — far better fumes than any other explosive. Du Pont has even developed a special wrapper for their Gelatins which reduces the amount of noxious fumes to an absolute minimum.

Greatest Disruptive Force, that can be contained in any commercial high explosive of this grade.

DU PONT



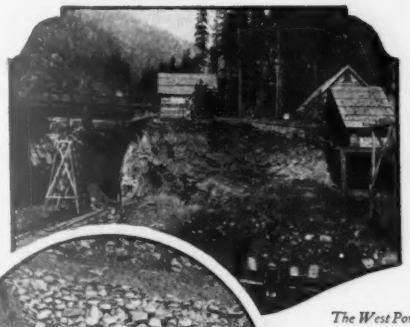
Make a World Record

A. Guthrie & Company, Inc., advances 8 ft. x 9 ft. heading 1157 feet in one month

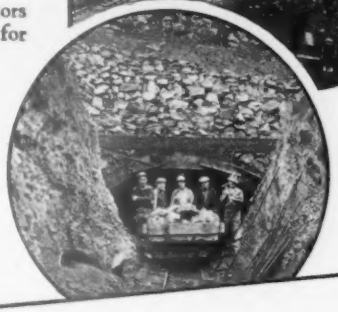
THREE successive times, the world's record was broken at the Great Northern Railway Company's tunnel under the Cascade Mountains at Scenic, Washington. In August, 1926, the tunnel was driven forward 937 feet, this record to be in turn broken in September by another record drive of 984 feet, and finally in October, the world's record again eclipsed by a 1157 foot advance. This tunnel, to be 7.78 miles, had to be driven through solid granite. As much as 180 gallons of water per minute was encountered. The tunnel must be completed in two years—the contractors have to make every day count. They use du Pont Gelatin exclusively for all blasting. It met the conditions they had to contend with. It gave them the results they wanted. The workmen liked to work with it.

The work is carried on under the general direction of J. R. W. Davis, chief engineer, Great Northern Railway, St. Paul, and under the personal direction of Col. Frederick Mears, assistant chief engineer, lines west, Seattle. M. J. C. Andrews is the resident engineer. He is assisted by E. S. Jackson at Berne, and M. A. Clegg at Scenic.

For A. Guthrie & Company, Inc., the work is under the personal direction of J. C. Baxter, vice-president, St. Paul, Minnesota. The field forces are under the following staff: R. F. Hoffmark, general superintendent; W. E. Conroy, assistant superintendent; O. C. Hartman, Frank J. Kane and C. G. Jones, superintendents at West Portal Mill Creek Shaft, and East Portal, respectively.



The West Portal, showing the main tunnel.

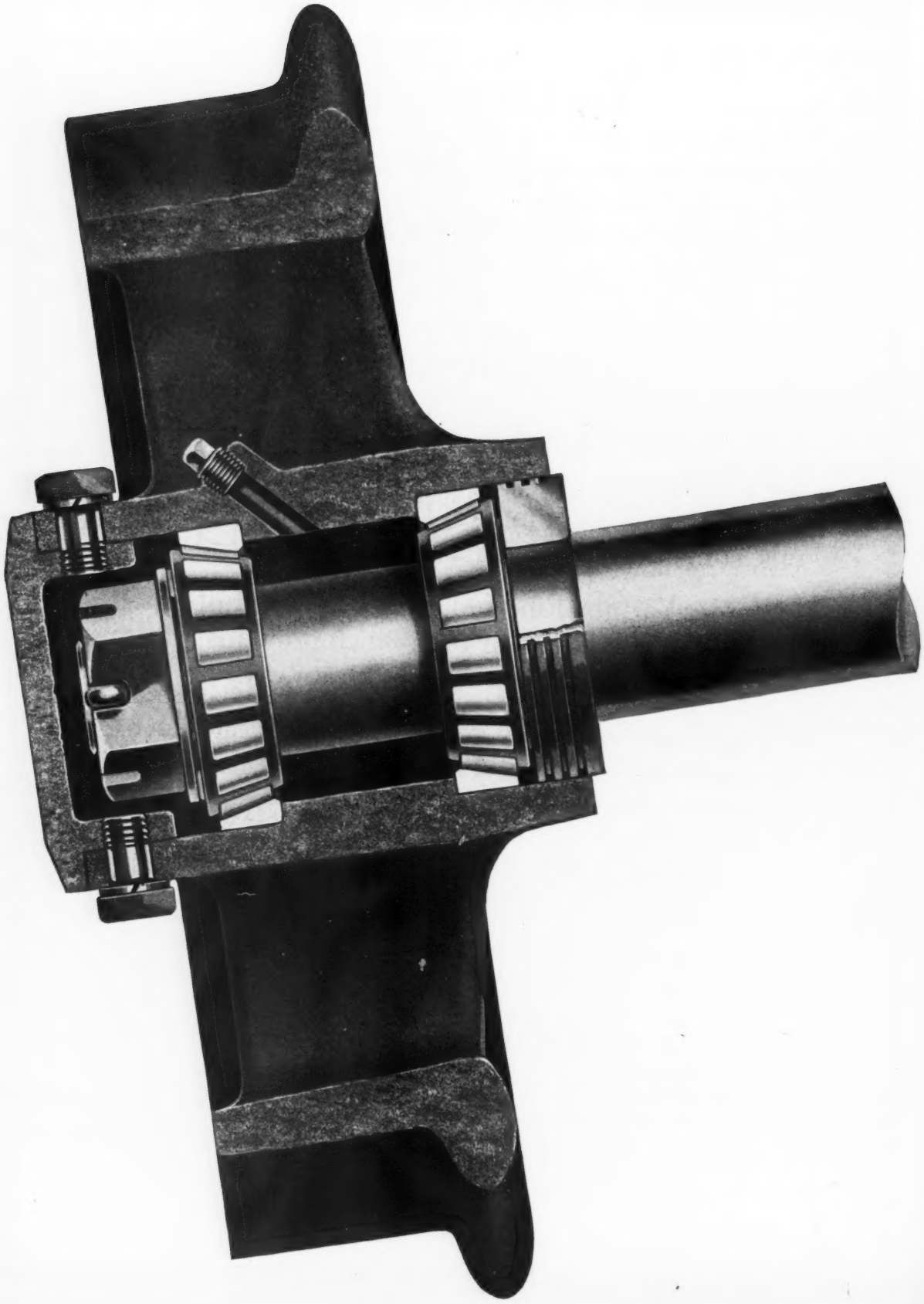


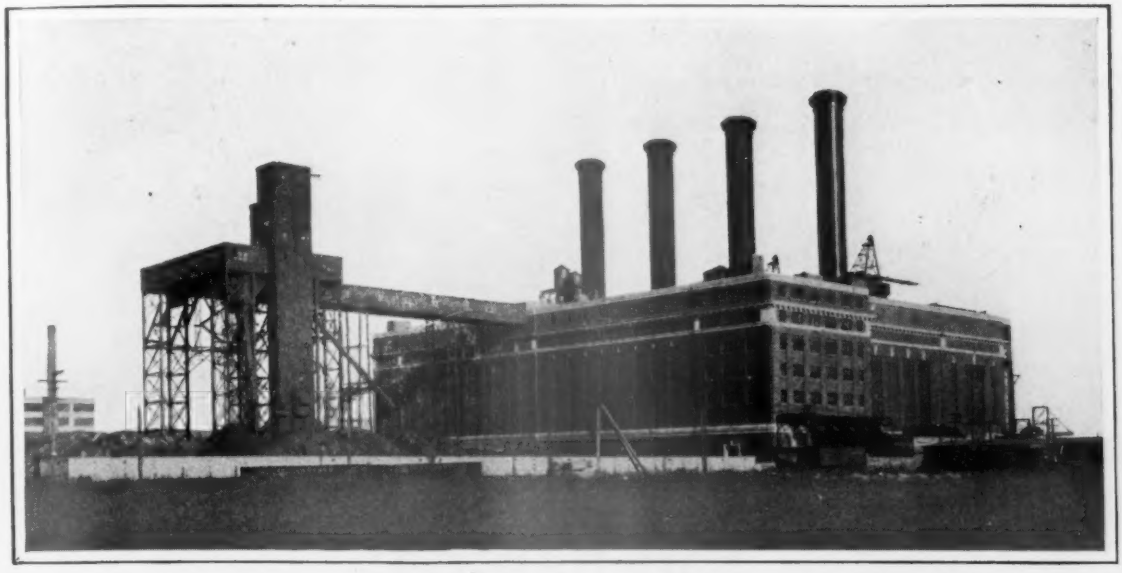
Top heading on the East Portal at Berne, Washington.

E. I. DU PONT DE NEMOURS & CO., Inc.
Explosives Department
WILMINGTON, DELAWARE

CERTIFIED CORRECT:—
M. J. C. Andrews RESIDENT ENGINEER
M. G. Clegg INSTRUMENT MAN
J. M. Waters LEVEL MAN
A. GUTHRIE & CO., CONTRACTOR
BY W. E. Conroy ASST GEN. SUPT.
STATE OF WASHINGTON

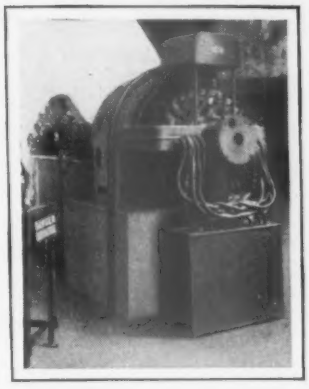
DU PONT





Protecting the draft

ENGINEERS who visit the new Hell Gate Station of The United Electric Light and Power Company, New York, always pay particular attention to the efficient draft system for the boilers. Twenty-one fans each of 140,000 cu. ft. per minute capacity for induced draft and sixteen each of 120,000 cu. ft. per minute for forced draft were furnished by the B. F. Sturtevant Company. Each fan is driven by a BTS brush shifting polyphase motor of approximately 200 HP, manufactured by the General Electric Company. These fans must run with absolute dependability of speed control, for on the mathematical precision of their performance depends a large part of the economy realized by the boilers of this immense station, whose capacity will soon be increased to the tremendous total of 445,000 KW.



To assure the reliability of these draft motors throughout the wide range of speed at which they must operate, our brushes were chosen. NCC grade 259 is used on the forced draft fan motors. Grade R-14, made by our Corliss Division, is installed on the induced draft fan motors. These brushes have fulfilled every expectation since the day the station was opened. Work is proceeding on the installation of the 160,000 KW American Brown Boveri turbo-alternator (double the size of the next largest unit built in this country) with full confidence that when its demands come upon the boilers the draft system will perform just as perfectly at full load as it does now, with only the Westinghouse and G. E. equipment installed.

NCC brushes are available for all who generate, convert or utilize electric power for the protection of the service and the assurance of economy. Our Sales Engineers are at your call and will assist you in selecting the proper brushes for your machines.

National
Pyramid Brushes

Manufactured and guaranteed by

NATIONAL CARBON COMPANY, INC.
Carbon Sales Division

Cleveland, Ohio — San Francisco, Cal.

Canadian National Carbon Company, Limited, Toronto, Ontario

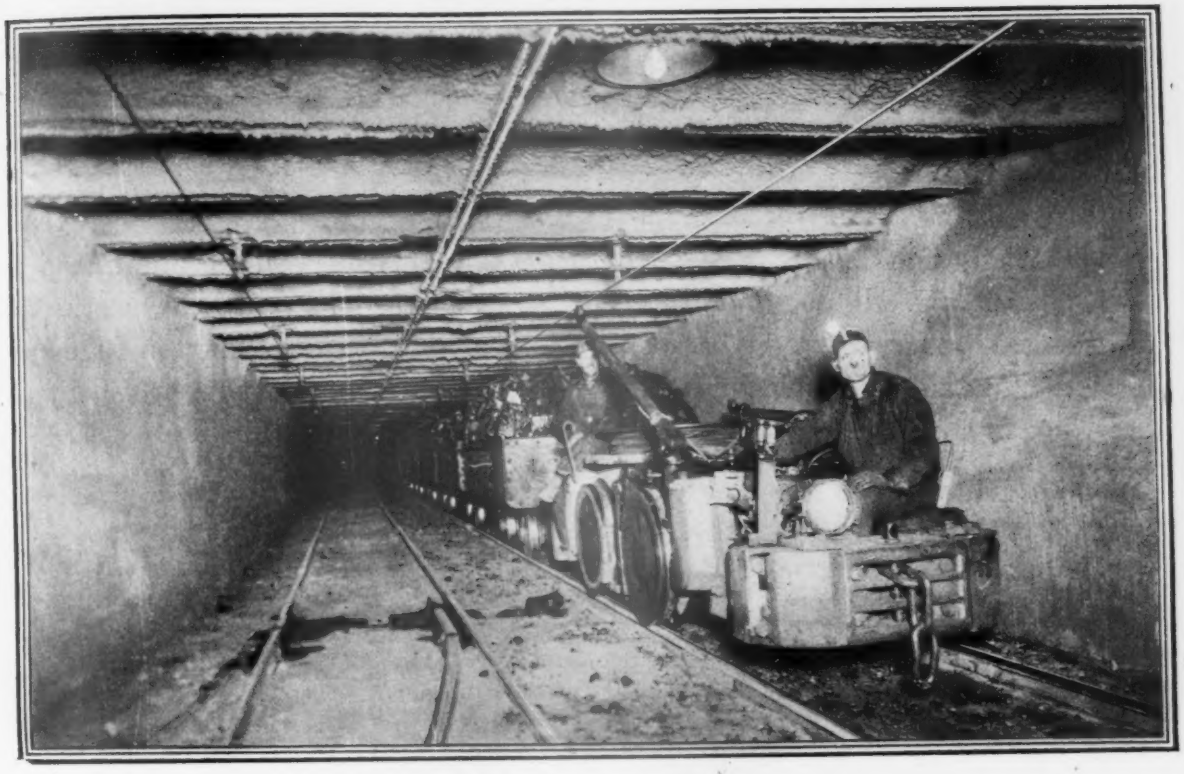
Emergency Service Plants

CHICAGO, ILL. 551 West Monroe St. Phone: State 6092

PITTSBURGH, PA. Arrott Power Bldg. No. 3, Barker Place Phone: Atlantic 3570

NEW YORK, N. Y. 357 West 36th St. Phone: Lackawanna 8153

BIRMINGHAM, ALA. 1824 Ninth Ave. N. Phone: Main 4016



Anaconda means Economy

ANACONDA
from mine to consumer

WIRE PRODUCTS
Copper Wire
Solid or Stranded
Bare, Weatherproof
and Slow Burning
Varnished
Cambric Cable
Lead and Braid Covered
Paper Lead Cable
Trolley Wire
Copper and Hitenso

ANACONDA Trolley Wire assures economy to the mine operator because it provides dependable power and thus prevents breakdowns, congestion and costly haulage delays.

It is tough, strong and durable. Its conductivity is unexcelled because it is made of Anaconda Electrolytic Copper over 99.9% pure.

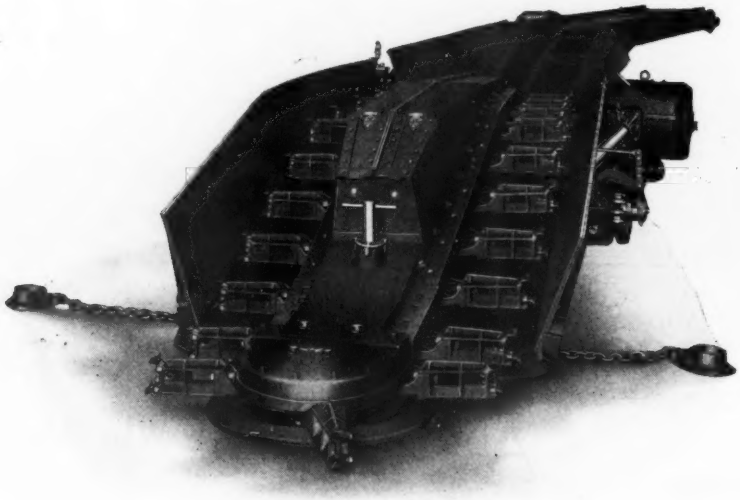
Six wire mills offer a coast-to-coast service unequalled for promptness and dependability.

ANACONDA COPPER MINING CO.
THE AMERICAN BRASS COMPANY
Rod, Wire and Cable Products
General Offices: 25 Broadway, New York
Chicago Office: 111 W. Washington St.

ANACONDA TROLLEY WIRE

As important in history as the harvester

COMPARE the status of the American farmer with that of the European peasant who still does most of his tilling by hand. The release from grinding toil granted the farmer by the harvester is known as a turning point in industrial history. Like the harvester the COLODER is the harbinger of higher standards of living; of a higher civilization.



AGRICULTURE AND MINING are the two basic industries. Mechanization is changing the whole aspect of the mining industry as it has done already in agriculture. In both cases, those who have pioneered have made the greatest progress, won the highest rewards.

Today finds the COLODER a finished loading machine with a background of 30 years of development experience. Let our Mining Engineering Department survey your conditions. Send for a catalog.

THE COLODER COMPANY, INC.

568 North Fourth St., Columbus, Ohio

THE COLODER

COAL finds its way out of your mine on a steel map. The efficiency of movement of every lump that comes out depends on that map. That efficiency, increased to daily tonnage and totaled into yearly output, becomes a large factor for economy or for cost. Serviceability of track—the chart by which your output travels—depends on three factors—construction, skill and care of the map maker, and maintenance. CENTRAL'S service and equipment has speeded production, cut costs and increased safety at many mines. Let us serve you.

Catalog No. 3 free on request.

THE CENTRAL FROG & SWITCH CO.
CINCINNATI, OHIO

CENTRAL
TRACK EQUIPMENT

The MINING CONGRESS JOURNAL

PUBLISHED EACH MONTH BY THE AMERICAN MINING CONGRESS MUNSEY BLDG., WASHINGTON, D. C.

Subscription Rate: Per Year, $3.00 Single Copies: $0.30

VOLUME 13 FEBRUARY, 1927 NUMBER 2

THE COAL LABOR SITUATION

THE PEOPLE want industrial peace. It is essential to the well-being and prosperity of the nation. When an industrial disturbance threatens to tie-up, even temporarily, a major portion of a great basic industry, such as coal, the people look to the Government for protection and relief. They have no alternative except to stand by and watch the progress of the struggle for supremacy between the contending forces; and while the contest is being waged, the people suffer.

While conditions in the bituminous coal fields are not very encouraging, there are certain things that modify the situation as it appeared even as recent as a month ago. Congress has refused to pass legislation interfering with the industry. Many bills remain on the calendar, calling for everything from confiscation to the more mild demands of further "investigation." There is every likelihood that these measures will die with the closing of the 69th Congress, although President Coolidge in his annual message to Congress emphasized the necessity for immediate action.

Steadily increasing stocks of coal throughout the country are piling up. Prospects for large reserves of fuel above ground, together with production capacity of the non-union mines, has done much to allay the Government's anxiety concerning the state of industry should a strike result next March. According to the Department of Commerce these reserve stocks amount to between 50 and 60 million tons. It is estimated that these reserves, coupled with capacity production of the non-union fields discounts the imminent dangers should a strike occur.

Failure of the miners' union to cooperate to the fullest extent with the operators in the union fields in reaching a satisfactory wage agreement will prove exceedingly costly to the miners, and, of course, to the operators. The union operators can not afford to lose their markets to the non-union fields. The union miners can not afford to stand upon demands that will bring about such a result. Their interests and those of the operators primarily are the same, and can be best served if the union mines are kept going. High wages, short hours, and the check-off can mean nothing to the miners' union if there is no work for union miners because of no market for the coal produced in the union fields at prices that will cover cost of production and permit the union mines to operate. Prosperity in the union fields, employment that will permit union miners to provide the necessities of life and health, and preservation of markets for the products of the union fields, all depend very largely upon whether the miners' union decides to cooperate with, rather than dictate to, the operators.

It is a fact that in instigating an industrial war, labor leaders in the past have shown an unconscionable disregard for the rights of the people. These leaders have been the aggressors, and they have been able to compel acquiescence and obedience to the plans they initiate for imposing their demands upon the employers in industry. Notwithstanding this, when legislation is proposed for regulating industry, it always is directed at the employers and never at the labor organizations. If it is right to control employers, why not also the labor unions? Why should the alleged culpability of one group in an industrial controversy be made the basis for Government action while no thought is given or action taken to deal with censurable conduct on the part of the other group? Why pounce upon one and ignore the other?

The people should be impartial judges. The Government should be an impartial arbiter, if it acts at all in a labor dispute. Responsibility in a general industrial controversy does not rest upon one side alone. It usually rests with the aggressor. One side should not be held responsible and called to account, while the other is allowed to remain irresponsible, and left free to dominate at will a situation largely of its own creation.

While President Coolidge advocated action to provide for emergency legislation, it is plain that he does not favor any plan savoring of permanent regulation. At least two members of his Cabinet are opposed in principle to any sort of Government regulation of the coal industry. Secretary of Labor Davis in discussing coal problems at the recent convention of the American Mining Congress, said: "The public no more wants Government interference with the coal industry than do the operators." Secretary of Commerce Hoover, in an address to this same meeting, stated that he is opposed to Government interference in business. He insisted that every time the Government had attempted to regulate business, it had been at the direct demand, the overwhelming demand, in fact, of a large part of the citizens of our country.

We believe the President is opposed to any sort of regulation except as a measure of last resort. But, we believe he favors regulatory powers that can be applied with equal force and justice to both employers and employees, if a grant of such powers through legislative action is finally adopted.

Labor leaders who soon will enter negotiations with the coal operators for a new wage scale undoubtedly expect to enforce their demands, without regard to the question of reasonableness, by holding over the coal operators the threat of one-sided regulatory legislation. If these leaders thought for a moment that such legislation would not be one-sided but would apply to them and their organization with equal justice, they would quickly seek to cooperate with the operators in an effort to reach a reasonable basis for a new wage agreement. But as long as they feel secure in the knowledge that powerful, and perhaps controlling, political factions will play their game as the negotiations develop and the controversy waxes warm, they will strive to dictate without thought of compromise or cooperation.

What the country needs is industrial cooperation and not more legislation. And we will have better industrial cooperation if Congress will make it clear that there is to be no one-sided regulatory legislation.

INNOVATIONS INSPIRED BY MINORITIES

HERBERT HOOVER told mining men at the convention of the American Mining Congress, in Washington, that all centralization of power in Government is the direct demand of well organized groups of citizens; that it is rarely that Government itself initiates movements to extend its authority. He insisted that the states have acquired the alarming habit of passing on to Washington problems that should be solved by the states themselves; that the demand on Congress by well organized groups for this or that measure of legislation that will put Government into business is responsible—entirely—for what we now have of this evil.

Small minorities when properly organized can make a noise like a million people. They have fooled lots of folk before this, and will, no doubt, do so again; but the fact remains that it is the clamor of these minorities—not a vast overwhelming demand of the populace—that is bringing about centralized Government at Washington.

Mr. Hoover points out that bureaucracy seldom seeks to expand itself. This has not been the general experience. For the one Government agency that is content to confine its activities to any restricted effort, there are dozens that yearly make desperate efforts to convince Congress that their activities should be expanded and their appropriations doubled. And this, without much thought as to any duplication of effort. Also witness the difficulty of discontinuing the activities of any bureau or commission once it is established. Usually, after a struggle, the public gives in, and we have agencies, temporarily created, that carry on and on interminably.

At present the people are confronted with many projects to put the Government into business in competition with private enterprise. If the sponsors for those projects—the organized minorities—are successful in putting Government further into business, whose fault is it? Did the public want the Cape Cod Canal purchased and operated at public expense? This was originally a private enterprise which failed to make good. It has now unloaded on the Government. Do the majority of the people want grain elevators on the Mississippi River to be established, owned and operated by the Government in competition with private capital? Do the people, or any reasonably large proportion of them, wish the Government to go into the coal business? Or, would any large proportion advocate an international alliance to buy up all the gold properties in the world, and operate them under Government control?

Whenever the price of a commodity has for one cause or another reached a level that is unsatisfactory to an industry, frequently rehabilitation of that industry depends upon some form of Government assistance. Usually, at the inception of such a movement, there is no thought of Government control of that harassed industry, but inevitably an industry in the doldrums if it does not watch its step arrives at that port.

Congress, while representing the country as a whole, represents first the various states, second, the various sections, and lastly, the Nation as a whole. This may not be as appropriate as we are led sometimes to believe; but it is nevertheless a fact, and under Constitutional Government it should be so. Such a situation will always create howling minorities. It is necessary for Congress and the general public to learn to be able to distinguish between the real and the unreal; between the cries of the yelling mob and the great conservative, though too often silent, thought of the Nation.

HOME CONSUMPTION AND MASS PRODUCTION

THE OUTSTANDING CAUSE of our present-day industrial expansion is productive efficiency. With ample capital, skilled direction and mass production we are able to pay large wages and still sell our goods in the markets of the world. All of these three elements are necessary to this result.

Mass production is only possible in a country where there is a very large home consumption. A sufficient home consumption has never been developed in any country which does not protect its home markets for the benefit of its own producers. The great home market of this country is not equalled by any other in the world. Its demands suffice to keep most manufacturing lines running at full speed the greater part of each year. The profits to be derived from this market have developed large manufacturing units equipped to produce more cheaply than would be possible with smaller units and because of that cheap unit production this country is able to sell its surplus products in foreign markets.

European manufacturers of automobiles not long since decided that by mass production they would be able to hold their own market as against American manufactured motor cars. The further development of this idea conclusively shows that one of the necessary elements was lacking—namely, a home consumption which would support mass production.

A well-developed home market is the essential of mass production, which in turn is an integral part of industrial success.

THE REIGN OF COMPLEX ORES

FIFTY YEARS AGO Gold was king, and the ambitious miner spent his day seeking promising gold properties. But the situation has changed strangely in recent years. Reports from the United States Geological Survey for 1926 show conclusively the passing of the purely gold or silver mine, and the rise to prominence of the complex ores.

One major disadvantage encountered by the complex ore miner is that the fall in price of any one of the major components creates a decrease in the value of the entire output; an advantage being the converse, an increase in price of any major component puts the entire output on a profitable basis.

But 1926 statistics unfortunately register a decrease in value while output increased materially. This is due largely to the great drop in the price of silver. Major strides were made in 1926 in metallurgy, and production of all metals was substantially above 1926 figures, with the exception of gold which continues steadily to decline. Copper production increased substantially, and although the export situation did not measure up to the expectations of the operators, domestic consumption increased in a surprising manner. Lead and zinc maintained splendid levels, as did iron ore production.

Our mineral future rests upon the further development of complex ores. Large deposits exist, and much experimentation is being carried forward upon low-grade lead and zinc ores and iron ores, and a definite effort is being made to utilize our lignite coal reserves. With ways and means provided for their recovery and utilization the country is assured of minerals for many centuries.

THE ADVANCE OF SOCIALISM

AT THE PRESENT TIME when the press of this country is filled with criticisms of Mexico largely based upon its recent actions with reference to mineral claims and its proposal to force all foreign owners to surrender such claims and accept instead a renewable right to operate for a term of years, it may be interesting to compare her attitude with the action of the United States in connection with the oil, coal and hydro-electric power resources of the West.

We find it difficult to distinguish between the present action of Mexico and the action of the United States Government with reference to coal claims in Alaska. During the pioneer days of the West the United States Government regarded itself as a trustee of the public lands for the benefit of the then maturing states. In consideration of the hardships which must be endured in a new country title to these lands was given to claimants wherever and whenever an applicant had lived up to the requirement of the Federal law. Whatever contests then arose were contests between rival claimants for the same property in which contest representatives of the Government sat as judges to decide which of the rival claimants had the best right to the property in question.

This policy was satisfactory to the Government, was satisfactory to the pioneers of the western states, and resulted in a development of a wild and mountainous country unparalleled elsewhere in the world.

Then the insidious bug of socialism entered into the public conscience. Mr. Gifford Pinchot, with the aid of President Roosevelt, sold to the country his idea that the United States Government was a landlord holding for the benefit of the whole Nation, rather than a trustee for the benefit of the growing states.

Prior to the adoption of this theory coal had been discovered in Alaska, closely following the development of Alaska's gold reserves. The gold mining development of Alaska called for the use of fuel. Notwithstanding the very remote distance from the coast, the still more remote distance from any considerable market, something like 300 pioneers located coal lands in Alaska, paid to the Government $360,000, at the rate of $10 per acre, which was the then price fixed by the Government for coal lands more than ten miles from any line of railroad. These men spent from four to six million dollars building roads, and protecting their claims, but before any patents had been granted the attitude of the Government had been reversed.

As a net result of these efforts the pioneers who undertook to develop Alaska's coal claims and furnish fuel for western development were forced to defend themselves against charges of criminal conspiracy against the Government, tried at points far distant from their Alaskan operations. All of these men were acquitted, but the coal lands taken in accordance with the then existing law under which every requirement was met were by devious means taken from them.

Alaska is still burning British Columbia coal; the white population of Alaska has decreased very materially and these coal lands are still open for appropriation under a leasing system.

This seems to be exactly what Mexico is attempting to force claimants for mineral reserves in that country to accept, in place of the title granted in accordance with the law at the time of appropriation.

The injustice of the landlord theory of public land ownership against the theory of trusteeship for benefit of the growing states, can only be understood by those who appreciate the genius of western development. One theory makes for the growth of self-respecting industrial communities; the other tends to socialism.

PROPOSED TAX AMENDMENTS

TWO PROPOSALS affecting tax cases pending before the Bureau of Internal Revenue have been made in bills introduced in the Senate. In one, Senator Couzens proposes to transfer all the administrative functions of tax audit and tax review from the Commissioner of Internal Revenue to the Comptroller-General, and in the other, introduced as an amendment to the deficiency appropriation bill, Senator McKellar proposes that no refund in excess of $50,000 shall be paid until the case is reviewed and the settlement approved by the Board of Tax Appeals.

The adoption of either proposal would slow up the settlement of back taxes, already long delayed. The transfer of the functions of tax audit and review to the Comptroller-General's office might involve new regulations, rulings and procedure, which would undo practically all the forward steps taken recently by the Commissioner of Internal Revenue to facilitate settlement of back taxes and expeditious handling of returns of current and future years. The proposal to have the Board of Tax Appeals approve all cases involving refunds in excess of $50,000, would impose upon the board an additional burden which would make it practically impossible for it to function, as its dockets already are loaded to such an extent that it can not, with its present membership, expeditiously dispose of the appeals pending before it. The present condition of the board's docket justifies an increase of its membership. If it is constituted a reviewing agency, as well as an appeals' body, adequate personnel would have to be provided.

Congress created in the 1926 Revenue Act a Joint Committee of both Houses to investigate the whole situation respecting administration and simplification of the present income tax system, and provided that this committee shall report its findings not later than December 31, this year. It would be well not to disturb the present system by any hastily conceived or ill-considered amendment affecting the administration of the income tax law; but rather to rely upon the Joint Committee to work out proposals based upon its findings, after hearings and mature deliberation upon the actual needs of the present system. The wise course, then, for Congress to pursue is to reject these present proposals or refer them to the Joint Committee for report at the next session.

PASSING OF THE PARKER BILL

THE BITUMINOUS coal industry particularly and that part of the business world which understands the coal situation generally, will be delighted to know that the House Committee on Interstate and Foreign Commerce has decided by a substantial majority to lay aside from present consideration the so-called Parker Coal Control Bill.

For several years past there has been an almost continuous agitation for some sort of legislation which it was hoped would solve a supposed public coal question. We have insisted at all times that

there is no public coal problem. The problem in coal is a problem of the operators and miners who because of vast over-production capacity have been forced into partial idleness.

For many years the consumption of coal in the United States doubled every ten years. At the present time this increase in consumptive capacity has been largely curtailed by the use of fuel oil, hydroelectric power and more scientific utilization methods.

When Congress desires again to consider the coal question we trust it will do so with a desire to aid the industry by stabilizing production thereby furnishing opportunities for moderate but uniform profits, rather than from the unfounded attitude which seeks to curb and restrain a supposed coal baron which unfortunately has no existence.

There may be need for legislation which will apply to all of the natural resource industries which will make possible a stabilization of production and thereby decrease production costs, stabilize the price to consumers, conserve our wasting assets and at the same time leave a fair and stable profit to the operators, but there should not be any legislation which applies only to one separate branch of any industry.

SENATORIAL AUTOCRACY

THE CONSTITUTION of the United States provides that no state shall be deprived, without its consent, of its equal suffrage in the Senate. Yet, the Senate, by its action in excluding the Senator-designate of the State of Illinois, ignored that plain mandate of the Constitution. This action was based upon the theory that the clause of the Constitution making the Senate sole judge of elections, returns and qualifications of its members, gives the Senate the power to consider any matter pertaining to the general qualifications or fitness of a Senator-elect or Senator-designate prior to his admission. That was the contention of the Senators who led the opposition to the admission of the Senator-designate of Illinois.

But what does the Constitution say? It prescribes the qualifications that shall be considered. It provides in Article I, Section 3, Clause 3, under the title "Qualifications," that "no person shall be a Senator who shall not have attained to the age of thirty years, and been nine years a citizen of the United States, and who shall not, when elected, be an inhabitant of that State for which he shall be chosen." Has the Senate power, under the Constitution to deny admission to a member-designate, if these prescribed qualifications are met. We think not. We believe that the Senate must seat the Senator-elect or designate, and deal with him further, if circumstances justify it, under the power granted to expel a member, with the concurrence of two-thirds.

The State of Illinois has the right to insist upon the seating of her Senator-designate. Neither her people nor her government should submit to arbitrary and despotic usurpation of power by the Senate whereby she is deprived, even temporarily, without her consent, of her Constitutional right to equal suffrage in that body. Illinois should insist that the plain language and intent of the Constitution be followed, that her Senator-designate shall be seated, and that the Senate shall not expel her Senator, except by the concurrence of two-thirds.

The Constitution is the bulwark of our Republic. The growing tendency of certain political groups to read into it language and powers that are not there, and to ignore its mandates and express provisions, should be curbed. The present situation would be extremely serious if some vital question were pending in the Senate in which the State of Illinois might be deeply concerned.

It is significant that the Senate divided along political lines, the so-called regular Republicans voting to admit the Senator-designate, the Democrats, with two or three exceptions, voting to exclude, and the so-called anti-administration or progressive Republicans, voting with the Democrats. It seems clear that political considerations rather than moral principles, or ideals of political righteousness, or Constitutional rights were the controlling motives behind the action of the majority. Thus it would appear that the arguments against the Senator-designate based upon the question of propriety of campaign contributions and expenditures in the Illinois primary campaign, were advanced merely as a camouflage for political maneuvering.

We hold no brief for the Senator-designate thus temporarily excluded. It may be that the Senate's inquiry will disclose sufficient grounds for his expulsion. We believe, however, that the Constitutional procedure is clearly prescribed; that the Senate violated the Constitution in excluding the Senator-designate; that a sovereign right of the State of Illinois has been denied; and that the only proper course for the Senate to follow, is to seat the Illinois Senator, and then by two-thirds vote expel him if grounds therefor are established.

Every Senator is under oath to abide by and uphold the Constitution of the United States. If they are permitted to disregard it, or to interpret it to suit political plans, with impunity, it will not long stand as a guarantee of human freedom, equal rights, and State Sovereignty.

SILVER

THE ANNUAL Silver Market Review for 1926 of Handy and Harmon, of New York, while not encouraging as to the future market for silver is nothing like as gloomy as the impression which prevailed shortly after the report of the Royal Commission on Indian Currency and Finance was first made public in the United States.

This report shows that in the United States and Canada the consumption of silver in 1926 was 33,500,000 ounces, an increase of two and a half million ounces over the consumption of 1925; in the sterling silverware trade an increase of 3 percent, and in the silver-plated ware an increase of 4 percent over the 1925 consumption. As against this increase in the use of silver the coinage in the United States decreased from 17,000,000 ounces to 6,700,000 ounces, but at the same time the production of silver in the United States decreased from 66,000,000 to 62,000,000 ounces while production in Mexico increased from 92.9 millions to 93.7 millions, and in Canada from 20,200,000 to 21,900,000 ounces.

During the year 1926 the proceeds of the base coinage in England was but 700,000 ounces while in the previous year, 1925, the proceeds from this source amounted to 7,000,000 ounces. While India is not likely to be a purchaser of very large amounts of silver in the future as she has been in the past, it does not seem probable that much of the Indian silver will be placed upon the market and there is even a probability that India will still be a purchaser but upon a much smaller scale than heretofore.

On the whole the promise is for a fairly stable market at a price which is very low as compared with the cost of production.

THE VALUE OF TAXPAYERS' ASSOCIATIONS IN SOLVING STATE AND LOCAL PROBLEMS*

Taxpayers' Associations Prove Efficacious In Securing Economies In State And Local Expenditures And In Preventing Unnecessary Increases In Public Indebtedness—Such Associations Crystallize And Direct Public Sentiment

By A. G. MACKENZIE†

ONE effect of the tremendous increase in taxes has been the propagation of the organization idea among taxpayers. The facts of taxation in the western states make it readily understandable why the idea has its most general manifestation in that part of the country. These states are thinly populated and only partially developed. Title to from 40 to 85 percent of the surface of each state is held by the National Government and is, consequently, untaxable and subject to very limited use. Yet the demands for public needs and luxuries are as vigorously urged and about as fully met there as elsewhere in the country, despite the comparatively meagre tax avenues and sources. The situation, therefore, impressed itself with special force upon taxpayers in the West. Organization was facilitated by interdependence of industries and activities of these states and by the fact that taxpayers there are disposed to be more self-reliant and are better informed with respect to state and local affairs generally than in the more populous states.

Most of the Western States have active taxpayers' associations. Twelve of them have affiliated in a regional association. This discussion will deal with the experience in those states. Results attained in them are probably comparable with what may be done in others.

Of the three parties to taxation—legislator, collector and taxpayer—the taxpayer is the most important and is the one for whose benefit the other parties are presumed to function. Theoretically, his wishes are carefully ascertained and observed by his elected and appointed representatives. As a matter of fact, they frequently are not, and the taxpayer generally has been indifferent, unorganized, inarticulate and ineffective.

The legislator has abundant suggestion and incentive to impose taxes and the tax collector's activities are specifically prescribed. Both have organized support and established media for the presentation of their position and the accomplishment of their wishes. The taxpayer lacks these advantages except when he creates them through association with fellow taxpayers. Such association becomes valuable and effective to the extent that it gives the taxpayer more influence in tax legislation and in the collection and disposition of the money he supplies for governmental purposes.

Taxpayers' associations contribute most directly to the solution of their state and local problems through efforts for the utmost economy consistent with efficiency in the expenditure of public money. This is the controlling program of most of the existent associations, although they render other valuable services.

A typical and successful state association consists of a state committee, county committees and local committees where desirable, with as large an individual membership as can be obtained. Each committee has member representation of all classes of taxpayers within its jurisdiction. Committee members are selected by the class of taxpayers they represent. Political partisanship is eliminated and political officeholders are not permitted to serve on the committees. Committees effect their own organization and have full autonomy within their jurisdictions, subject only to the general policies of the association. State-wide, county and local mass meetings of taxpayers and conferences of committee chairmen are held frequently.

Solidarity of the association is maintained through avoidance of the subject of tax equalization and other questions upon which unanimous agreement is not attainable. All activities of the association are conducted publicly. Press representatives are invited to all meetings. Tax data, collected or compiled by the association, and other tax information are offered for publication in the general press and are placed in the publications of the association for the information of its members. Representatives of the association address business clubs and other organizations. Projects or acts are publicly opposed or publicly approved by the association, in accordance with the circumstances. Efforts are made at all times to ascertain the views of as many individual taxpayers as possible on every issue that arises.

The committees confer with tax and other public officials and bodies whenever a tax matter is under consideration. Independent audits and investigations of public accounts and public administration are made by representatives of the association. Bond proposals are analyzed in advance when possible and desired modifications recommended. All political parties are urged to nominate responsible men, especially for legislative offices, state or local. Close contact with legislators is established and maintained. The views of the association are conveyed to legislators through personal appearance of the taxpayers' representatives and through written analyses of proposed legislation.

Tax associations do much to put better business methods into public affairs. Treasury raids initiated in selfishness, partisanship, emotionalism or hysteria are discouraged through the application of cold fact and sound argument. The knowledge that all public disbursements or other official acts will be thoroughly and fearlessly scrutinized and the findings made public is a powerful deterrent to reckless expenditure and indifferent administration.

Through its organization the taxpayers' association can give the public official accurate and comprehensive information with regard to the sentiment of the community on any question; an authentic expression from their constituents such as most public officials desire and appreciate. These expressions are obtainable at any time through the association. This is a distinct advantage over a situation where the taxpayer is able to express his views only at periodic political elections and then in a much less forceful and less definite way. Sincere public officials cordially welcome the assistance the association can thus render to them and through them to the public. Such service is especially valuable to the legislator, who is required to act upon many measures about which he can not possibly acquire all desired information personally in the limited time at his command.

The education of the taxpayer himself is one of the important achievements of a taxpayers' association. This is stimulated through organization that extends to the smallest taxing units and that considers every item of public expenditure. (*Continued on page* 120)

* Address before 29th Annual Convention, American Mining Congress.

† Secretary, Utah Chapter, American Mining Congress. Salt Lake City, Utah.

INCOME TAX PROCEDURE*

Brief Review Procedure Bureau Internal Revenue In Handling Income Tax Returns, Covering Generally Channels Through Which Returns Pass And Various Steps Taken By Bureau Between Time Returns Are Filed And Time Final Settlement Tax Liability

INCOME tax returns of individuals, partnerships, fiduciaries, and corporations are filed with collectors of internal revenue for the sixty-five collection districts, or with their representatives in other large cities, who forward them to the collectors. As received, returns are examined as to correctness of form and execution and accuracy of computations and listed for assessment.

Returns of individuals are separated into two main classes: viz, Forms 1040A, for earned net incomes of not more than $5,000 derived chiefly from salaries and wages, and Forms 1040, for net incomes of more than $5,000, or, regardless of amount, if derived from a profession or business, including farming.

Classification of Returns

Personal returns on Forms1040A and returns of fiduciaries and partnerships, Forms 1041 and 1065, respectively, indicating a distributive or beneficial interest of $1,500 or less, are retained by collectors for audit in their offices. Forms 1041 and 1065 showing a distributive or beneficial interest in excess of $1,500 are forwarded to the appropriate internal revenue agent in charge for examination.

After returns have been separated as described above revenue agents temporarily assigned to collectors' offices review the returns of individuals on Form 1040 and of all returns of corporations for the purpose of classifying the returns as outlined below:

(a) Those returns that are determined to be properly prepared and should not require further audit.

(b) Those returns that can be adjusted by office audit.

(c) Those returns that will apparently require a field examination.

Returns of class (a) are marked "Accepted"; those of class (b) are marked "Office Audit", and those of class (c) are marked "Field Audit."

Collectors' Audits

Individual returns on Forms 1040A which are retained in collector's offices, as above indicated, are audited and in case of a change in the tax liability resulting in a deficiency, the taxpayer is given an opportunity to protest and is granted a hearing in the same manner as indicated hereafter in the case of returns on Forms 1040.

It will be noted that a large percentage of personal returns are audited and closed by collectors in whose offices they were originally filed. This procedure tends to bring the taxpayer and the collector into closer contact and to accomplish the audit and closing of personal returns at a date earlier than would otherwise be possible.

Income Tax Unit Audits

Returns of individuals on Form 1040 and returns of all corporations are forwarded to the Income Tax Unit at Washington with the assessment lists. Returns are checked with the lists and then given a preliminary audit or review of the original classification of the internal revenue agent in charge. Following this the card record of returns is made and statistics transcribed. Returns and control cards are sent to the files from which point returns classified as "Accepted," provided this classification is approved, are placed in closed files and those marked "Office Audit" and "Field Audit" are forwarded to the proper internal revenue agent in charge.

Field Division Audits

Upon receipt of returns the internal revenue agent in charge of each field division again reviews the returns and may change the original classification. Detailed examinations of taxpayers' accounts are made if a "Field Audit" is required, or given an "Office Audit" at which time the agent may request the taxpayer to furnish data in substantiation of his return. The taxpayer is then advised of the result of the audit and furnished a copy of the examining internal revenue agent's report or statement of the office auditor. Any protest against the assessment of additional tax which the taxpayer desires to submit must be filed within thirty days from the date of the letter from the internal revenue agent in charge notifying of the deficiency. The taxpayer may request a conference or may submit additional data in writing. After thirty days the case is forwarded to the Income Tax Unit at Washington with recommendation.

Deficiencies and Appeals

If the Unit agrees with the findings of the revenue agent the taxpayer is notified by letter and afforded an opportunity for a hearing. If an agreement can not be reached the sixty-day letter is sent by registered mail notifying the taxpayer of his right to appeal to the Board of Tax Appeals. When an appeal is filed with the Board the file is requisitioned from the Income Tax Unit and a representative of the Bureau appears in behalf of the Commissioner when the case is heard by the Board. If an appeal is not filed within the allotted time the deficiency in tax is assessed.

Special Audits

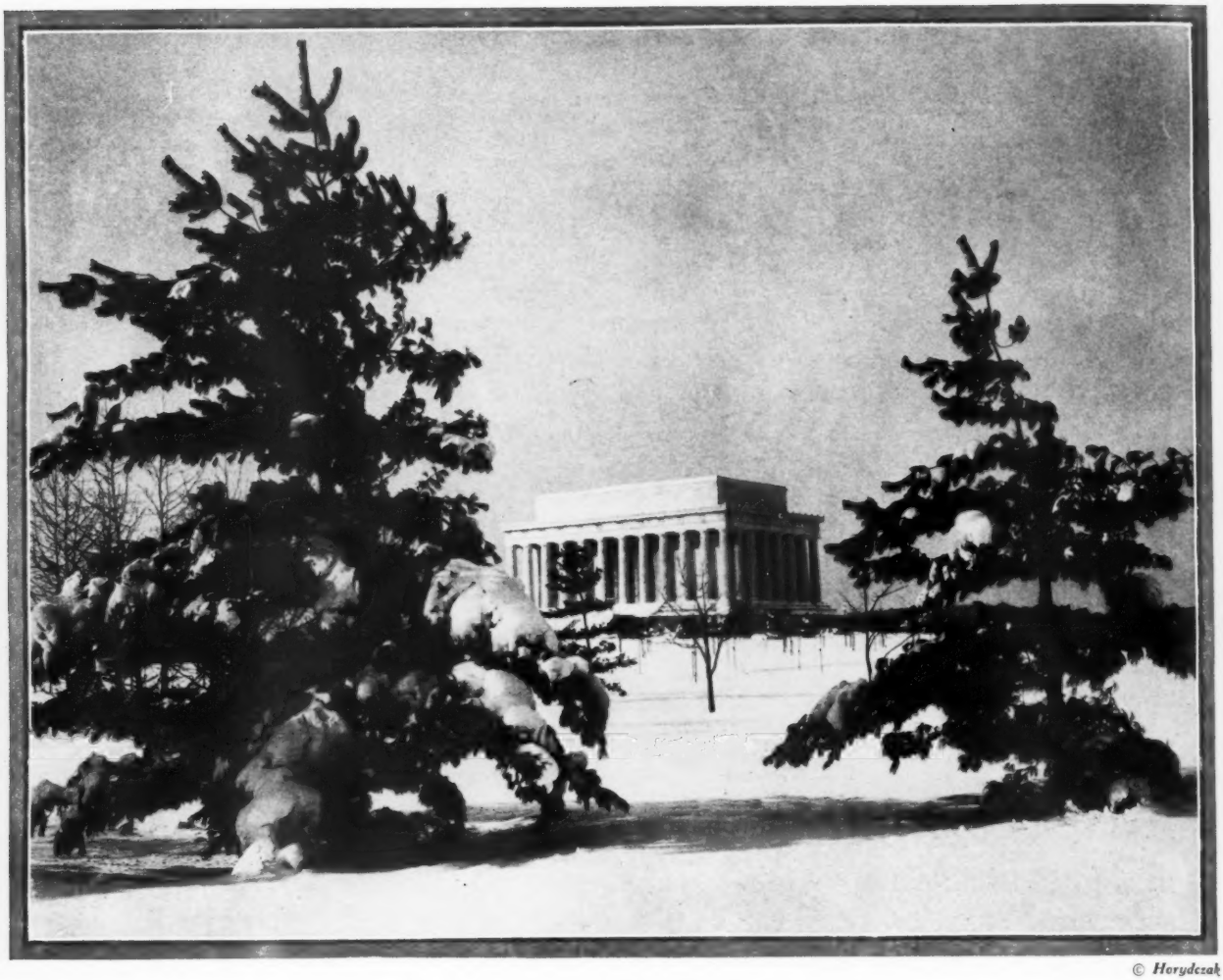
Returns showing deductions on account depletion of natural resources are given a special review and comparisons made with data in the possession of the Bureau from which the proper allowance for depletion is compiled.

Returns which indicate that they are intended to cover the operations of several corporations are routed, with the reports of agents, to a special group of auditors trained to review consolidated returns.

From year to year changes are made in the procedure which experience has shown will assist in the handling of returns expeditiously and with due regard for the rights of the taxpayer and of the Government.

Mercury is the only common metal that is liquid at ordinary temperatures, and this characteristic enables it to supply needs for which there are no known substitutes, states the Bureau of Mines, in a recently issued report. It alloys readily with certain other metals forming amalgams, many of which are plastic. The ease with which gold and silver amalgamate has been utilized for the recovery of those metals, but this use has been largely supplanted by the cyanide and flotation processes. The most important use of mercury is as a fulminate in blasting caps and other detonators. The metal, its mercurous and mercuric chlorides, and other compounds are used in medical preparations. Antifouling paints for ship bottoms are made with oxide of mercury which the salt in the sea water converts into mercuric chloride, thus forming an active poison. Mercury is also used in heating, electrical controlling apparatus, vapor lamps, cosmetics, vermilion, boiler compounds, dental amalgam, in thermometers, and by hatters and furriers in preparing raw materials.

* Extracts from remarks of A. B. Miess of the Bureau of Internal Revenue before 29th Annual Convention, The American Mining Congress.



© Horydczak

Let us have faith that right makes might; and in that faith let us to the end, dare to do our duty as we understand it.

ABRAHAM LINCOLN.

THE TASK OF THE CONGRESSIONAL JOINT COMMITTEE ON TAXATION*

Revenue Law Should Embody Only Principles And Should Not Be Cluttered With Administrative Regulations—Increased Responsibilities for Collectors And Field Personnel Urged —Other Practical Remedies Suggested

By McKinley W. Kriegh †

THE Revenue Act of 1926 established a joint Congressional Committee, known as the Joint Committee on Internal Revenue Taxation, to investigate the operation and effects of the Federal system of internal revenue taxes, the administration of such taxes by the Bureau of Internal Revenue, and measures and methods for the simplification of such taxes, particularly the income tax; and to publish a definite report thereon, together with recommendations for the improvement of the system, not later than December 31, 1927.

That committee is composed of five members of the House Committee on Ways and Means and five members of the Committee on Finance of the Senate, as follows: Representatives Green, Hawley, Treadway, Garner and Collier and Senators Smoot, Reed of Pennsylvania, Watson, Simmons, and Jones of New Mexico. Representative Green, chairman of the Ways and Means Committee, is chairman of the Joint Committee. All are experts in Federal taxation, experienced legislators, conservative statesmen, and able political leaders. It may be assumed, therefore, that the next revenue bill will embody provisions that will remove a large part of the difficulties in administration of the income tax law that have hampered the Bureau of Internal Revenue and that have been the sources of great annoyance to taxpayers and incidentally expensive negotiations with the Treasury and appeals to the courts.

The Revenue Acts of 1917 and 1918 were imperfectly drafted and hastily enacted. Many of the imperfections of these war-emergency acts were continued into the acts of 1921, 1924 and 1926. The difficulties and problems of administration were not materially improved by these later acts, but were in many respects aggravated by numerous amendments, made on recommendations of Treasury officials, which were designed largely to give Congressional sanction to rulings and practices of the Bureau of Internal Revenue; but in some instances to close alleged gaps in the law through which it was said taxes might be evaded. The conditions disclosed by the investigation conducted by a Senate Select Committee, of which Senator Couzens of Michigan was chairman, emphasized "the need for an institution of procedure" to quote Senator Smoot in his report to the Senate on the 1926 bill "by which the Congress could be better advised as to the systems and methods employed in the administration of the Internal revenue laws."

Heretofore, in the consideration of proposed revision of the revenue laws, proposals framed by officials of the Bureau of Internal Revenue and the Treasury Department have been given preferred consideration over the suggestions and recommendations of taxpayers. In the reports of the chairman of the Ways and Means Committee can be found this explanation of a proposed amendment: "The amendment proposed to this section incorporates in the law the present regulation of the Treasury." The point I wish to emphasize is that Congress has in the past given little or no attention to the hardships imposed upon taxpayers by the administrative provisions of the law, the necessary regulations promulgated by the Commissioner of Internal Revenue to make these provisions effective, or the cumbersome and expensive procedure required of taxpayers in securing final settlement of their tax liability. In consequence of the policy that has prevailed, iniquitous and indefensible amendments have been written into the statute over the protests of taxpayers, which in no sense simplified or improved the law or its administration or benefited the Government from a revenue standpoint. That this policy is now to be abandoned is indicated in the report of Senator Smoot, chairman, of the Senate Finance Committee on the 1926 act, wherein he states that Congress must have "a closer understanding of the detailed problems with which both the taxpayer and the Bureau of Internal Revenue are confronted," and "it (the Joint Committee) will employ the necessary experts and assistants through whom it will be in direct contact with taxpayers for the purpose of obtaining all needed information to assist in the framing of future legislation."

Relying upon this policy as announced by the chairman of the Finance Committee, a National Committee on Tax Cooperation has been formed, comprising representatives of the nationally organized groups of taxpayers, to assist in the study and investigation of the present internal revenue system, by functioning as a clearing house for suggestions for the improvement of the system, and by serving as an agency through which may be gathered such facts, data and information as may be necessary to furnish a proper basis for future revenue legislation. The American Mining Congress is represented on this taxpayers' committee.

With this introductory outline concerning the creation of the Joint Committee on Internal Revenue Taxation, its purposes and functions and its probable attitude toward the problems of revenue administration from the standpoint of the taxpayers, I shall now discuss some of the details of the task with which that committee is confronted. It is my firm belief that if the committee attempts to remedy the present system by recommending an occasional amendment here and there, it will accomplish little, if anything, of consequential benefit either to the Government or the taxpayers, but if it makes a definite and intelligent attempt to remodel the entire system of internal revenue procedure, scrapping in their entirety provisions of the law which should properly be left to administrative regulation, and incorporating in the law provisions that will protect the taxpayer from administrative abuses as well as the Government from loss of revenue from tax evasions, it will accomplish the end for which it was created.

Inasmuch as the Federal income tax system is in theory a system of primary self-assessment, the law should be shorn of the confusing and complicated technical provisions which are not understandable to the average taxpayer and give rise to misinterpretations and erroneous determinations of taxable net income.

If it were easy to comply with the law, there would be fewer mistakes made by taxpayers in the preparation of returns. The first task of the Joint Committee, therefore, should be to formulate a statute which would make possible accurate self assessment. To accomplish the best results, the Joint Committee should make a careful study of every phase of the law and administrative procedure affecting the preparation of the returns and the initial determination of taxable net income by the taxpayer. It should seek to apply the remedy at the

* Address at Tax Session of 29th Annual Convention, American Mining Congress.

† Chief, Tax Division, American Mining Congress.

point where errors are made, not where they are found.

Collectors of Internal Revenue should be invested with greater responsibility for the accuracy of returns filed. It should be the duty of the collectors' office to carefully examine all returns filed for the purpose of determining not merely whether or not returns are prima facie correct as to form and computations, but also whether or not they are prima facie substantiated in the supporting schedules. If errors are found in favor of the taxpayers, or if it appears that the taxpayer may not have availed himself of a deduction or any other right he may be entitled to under the statute, it should be the duty of the collector's office to so advise him, in order that the error may be corrected at the source. The correctness of the return is the important objective, and it should make no difference whether discrepancies that may be found are in favor of the Government or the taxpayer. As soon as the correctness of the return has been established to the satisfaction of the collector, it should be certified by him and then transmitted to Washington in the usual manner.

It is provided in the income tax regulations that each taxpayer shall adopt such forms and systems of accounting as are in his judgment best suited to his purpose, but this is subject to the qualification that his accounting records must enable him to make a return of his true income. Now if the taxpayers' accounting records are kept in accordance with approved methods, it should be presumed that they reflect his true income.

If, upon examination, his records appear consistent and complete so as to reflect true income, the Government's agent should not be required to examine further into the details of the taxpayer's business to determine the accuracy of the return other than to verify the figures carried into the return, unless there is some cogent reason for so doing.

The revenue agent or whoever makes the field examinations should first report to the collector on the taxpayer's accounting records. Are they kept on a basis that should reflect the taxpayer's true income? Then he should report on the figures carried from the books into the return, on the balance sheets, and on other schedules required by the return. Everything being found regular and accurate, his report should be favorable and should be accepted by the collector. The idea that some revenue agents seem to have that if the taxpayer's records do not conform to this or that system or theory of accounting, they should be challenged, is an attitude which should not be countenanced for a moment by the Treasury.

Revenue agents should be held responsible for their investigations, reports and recommendations. Palpable carelessness or indifference or inefficiency should be grounds for immediate dismissal from the service. It is entirely possible and feasible to maintain a check on the reports of field agents and when their reports are challenged by taxpayers and are shown to be misleading, erroneous, and perhaps wholly baseless, they should be removed from the service. Their retention is certain to be vastly more expensive to taxpayers than to the Government. The tax administration is judged by the public by the character and efficiency of its field personnel. Therefore, the department should hold its field personnel accountable for burdens imposed unnecessarily upon taxpayers because of carelessness, indifference and inefficiency. If field examinations and investigations are conducted in the first instance under the authority of the collector, incompetency will be checked.

I have never understood why returns should be checked and rechecked, audited and re-audited, reviewed and re-reviewed, over and over again from the time they leave the taxpayers' hands until they reach their final resting place in the Records Division of the Income Tax Unit, unless the system is faulty at the source. Collectors of Internal Revenue are in closer contact with the taxpayers of their districts than are any of the other officers or agents of the revenue organization and only incompetency would prevent the collectors' offices from securing the maximum of accuracy in ninety-nine percent of the income tax returns filed. The other one percent would cover the complicated returns of large business enterprises such as the railroad and manufacturing corporations engaged in interstate operations through branch offices or subsidiaries. I venture the assertion that no larger field force than is now employed would be required in order to enable collectors to certify ninety-nine percent of the income tax returns to Washington as prima facie correct.

I believe the personnel of the revenue organization to be honest and efficient, and that once the opportunity for the shifting of responsibility is eliminated by some plan such as I have suggested here, efficiency will prevail and prompt and final determination of tax liability will result. The application of a practical remedy at the source would relieve the pressure upon the Bureau at Washington, and the Income Tax Unit could devote more time to the settlement of back-tax cases, with the result that its work would soon be current.

New tax cases should be comparatively easy to handle. The exact facts are fresh in the minds of the taxpayers. Tax cases are new when the returns are filed with the collector. It is when they become old after months and even years in the process of reaching the time and place of office audit at Washington that they become difficult to satisfactorily explain, substantiate and settle. Need I say more on this phase of the subject?

The Commissioner of Internal Revenue, within the last year, has been gradually decentralizing the income tax unit. Internal Revenue Agents in charge of the field office have been given authority to hold field hearings in an effort to reach agreements with taxpayers without appeals to the income tax unit and conferences in Washington. The commissioner also has extended the authority of collectors in cases of individuals under $25,000 so that the collectors may make final decisions in such cases in the name of the commissioner, and appeals direct to the Board of Tax Appeals may be taken from the findings of the collectors. This unquestionably is a step in the right direction in that it simplifies and shortens the procedure and should greatly lessen the period of time that usually elapses between the filing of the return and final action by the income tax unit.

Thus far I have discussed procedure and organization. The Congressional Joint Committee doubtless will find that the simplification and shortening of procedure is one of the most, if not the most, important phases of its study. Then the committee will turn to the law. To what extent is the law itself responsible for the technical and confusing ramifications of the income tax system. The committee will have to analyze the law and its effects, section by section; the administrative rulings and regulations; and decisions of the Board of Tax Appeals and of the Courts. Taxpayers generally contend that the law can and should be simplified. The present law is replete with complicated provisions that are difficult of interpretation; and departmental construction and application of such provisions have been far from satisfactory from the standpoint of either the Government or the taxpayers. Let us consider a few of these provisions:

Section 202, relating to the determination of gain or loss from sales or exchanges of property, to the extent that its provisions cause taxation of unrealized profits, is difficult of administration, gives rise to numerous controversies, and produces little additional revenue.

If the Joint Committee finds that the elimination of some of the provisions of this section would merely postpone the taxation of profits until notes, securities, or other presently unmarketable consideration received in lieu of cash are converted into cash or have a ready market for cash at face value, it would seem better to allow the tax to be postponed rather than to levy it at once on the assumption that the full selling price will be realized. The Government should not harass a taxpayer by attempting to collect a tax this year on unrealized or

theoretical profits when it is certain to collect the same tax in a later year on the realized or actual profits from the transaction. By the first method of treatment there is created a disgruntled taxpayer. By the latter method, the taxpayer is relieved of any possible hardship and has no cause for complaint.

Sections 203 and 204, relating to corporate reorganizations, also are intricate and tend to complicate rather than aid the administration of the law.

These sections embody a scheme of cross-references that defies the grasp of the average taxpayer. They were devised by legal talent in the Treasury Department to prevent alleged and assumed profits from escaping immediate taxation. They can not be applied without controversy and expensive negotiations with taxpayers.

If such provisions are to be retained in the law to meet particular situations, new provisions might be added ad infinitum to fit stated sets of facts, and ingenious means could still be found to circumvent them for the purpose of evading payment of any tax until there was an actual realization of profit. Such provisions are of questionable value. Their effect psychologically is to challenge the taxpayer to avoid them by cleverly devised subterfuges. Such provisions do not compel honesty, but, on the contrary, tend to induce what might be termed ethical dishonesty.

The Joint Committee could well afford to devote careful study to these and other so-called refinements of the present law which were incorporated in the various acts, particularly the 1921 and 1924 acts, upon recommendation of the Treasury Department, and retained in the 1926 Act.

The American Mining Congress has never questioned the soundness of the theory of the reorganization provisions of the 1924 Act, but we have protested vigorously against their retrospective features which affect legitimate transactions back to December 31, 1917.

In the determination of taxable net income taxpayers are still at a loss to differentiate between items of expense and capital expenditures.

The Department's rulings on the question of when items of plant and equipment should be changed to capital account and when to expense are at variance with each other, and the decisions of the Board of Tax Appeals are of doubtful finality. The Board, however, adheres generally to what is known as the one-year-life rule that if an item of plant or equipment has a life of appreciably more than one year its cost should be capitalized regardless of whether or not it adds to the value of the property, increases productive capacity, or does anything more than serve to maintain the normal output of the mine or plant.

It is the duty of the Joint Committee to investigate the effect of the rule now being applied, to ascertain whether or not it is in accordance with the intent of the law, and to recommend proper principles for enactment into law in case it shall find that the present rule and practices are unfair and unsound. The American Mining Congress will make some recommendation on this matter at an appropriate time.

The subject of depletion probably will have serious attention of the Joint Committee. It is certain to be considered. It has been a much-debated subject in the past. The valuation of all the mining properties of the United States by the Bureau of Internal Revenue was a tremendous task. But the valuation work is practically completed. It has been accomplished in record time, if the time that has been required by the Interstate Commerce Commission for the valuation of railroads is considered. Therefore, the committee will find this problem largely disposed of, with most valuations completed and agreed to by the taxpayer, and the computation of annual depletion allowances reduced to a mere mathematical calculation by simple arithmetic.

Of course, there will be new cases constantly arising where revaluations are made necessary by the extension or discovery of mineral reserves not included in any prior estimate or valuation. Thus, the Bureau of Internal Revenue will find it necessary to maintain its Engineering Division with competent and experienced engineers retained from its present staff.

The matter of depletion allowances does not present an administrative problem of material importance at the present time. Therefore, the Committee doubtless will confine its efforts, in so far as depletion allowances are concerned, to a study of results during the period since 1926. An exhaustive study of depletion allowances in the bituminous and anthracite coal industries was made by the Senate Select Committee of which Senator Couzens of Michigan was Chairman. This study probably will be extended by the Joint Committee to all of the metals.

In so far as the principle of depletion is concerned, it has been subjected to severe tests, and has been successfully preserved. It is recognized as a permanent provision of the income tax law, and necessary to prevent the taxation as income of what in reality is return of capital invested.

The 1926 Act introduced a new provision for depletion allowances to the oil industry, fixing the annual allowance at 27½ percent of gross income, subject to the limitations that in no case should the allowance exceed 50 percent of the net income from the property nor be less than it would be if computed without reference to the percentage clause. The effect of this provision is being investigated, and if, upon careful analysis of results, the Committee shall find that the administration of the law has been simplified, and that at the same time taxation revenues from the oil industry have been enhanced, its retention undoubtedly will be recommended, and the Committee may go further by recommending a percentage basis for the mining industry to be applied as an alternative for the present bases of cost, March 1, 1913 value, or discovery value. Such a basis for the mining industry would have to be as an alternative to be used at the election of the taxpayer, on account of widely varying conditions in different mines and mining districts, and especially in different branches of the mining industry. In view of the importance of this matter, the Tax Division of the American Mining Congress has advised the Joint Committee of its desire and willingness to cooperate in every way possible in obtaining the exact facts and the concensus of opinion in the industry concerning present conditions as well as future proposals.

The Joint Committee will have no particular reason for spending much time in the consideration of depreciation, obsolescence, losses and bad debts unless complaints are filed by taxpayers against the rulings and practices of the Bureau in relation to these deductions.

The Bureau is now engaged in a study of depreciation with a view to setting up standard rates. The Bureau's data will be available for the use of the Committee. Depreciation is taken now in accordance with rules and regulations that are generally understood by taxpayers, and no serious administrative difficulties are involved, March 1, 1913, value having been established in practically all cases. The same is true as to obsolescence. When a loss is realized or a bad debt actually determined to be worthless, when not definitely established by legal action, are questions of fact on which controversies will continue to arise. There is slight opportunity for simplification of the provisions of law relating to these deductions. Any simplification that might be attempted would have to be with respect to procedure and probably would have to result in a change of attitude on the part of administrative officials with respect to their policy of resolving doubtful points in favor of the government instead of the taxpayer in order to be on the safe side in event of an investigation. (*Continued on page* 97.)

A SENSIBLE APPLICATION OF OUR ANTI-TRUST LAWS

Recent Decisions Of Federal Courts Have Done Much To Harmonize Anti-Trust Laws With Correct And Established Business Practice—Sensible Application Of These Laws Can Be Obtained Only By Constant Vigilance

By NATHAN B. WILLIAMS *

WHILE the Federal anti-trust law was passed almost a generation ago and while the Federal Trade Commission is almost twelve years of age, the past few months have witnessed a group of decisions in the Federal courts which have perhaps done more to rationalize our conception of the proper field of this legislation and to bring judicial determination of the question presented more nearly into harmony with correct established business practice than in all the period of the life of these laws heretofore.

As I apprehend it, this has come about primarily as an effect of the increased business organized activity which has educated not only business men but at the same time has effectively brought out with distinctness the benefits to be derived from associated effort by business organizations.

The early anti-trust cases mainly involved individual business units. They were based upon excresences of the times. The later cases have been of wider application and have been more energetically defended. There were two cases decided by the Supreme Court in June, 1925, which formally marked the outline of lawful associated activity. There was a time, and it has not wholly passed, when the Department of Justice contended that there could not be any vital, effective, organized effort between men or business units which did not violate the anti-trust laws. But in the two cases mentioned, commonly known as the Maple Flooring case and the Cement Manufacturers case, there was a clear recognition on the part of the court that business men were not required to be fugitives from information, but that they might establish agencies to collect and assemble vital information in respect to their respective businesses and that when they relied upon the intelligent business unit to use this information in the conduct of the business, that was violating no law. It is only when the individual business man surrenders to his group agent the determination of his business policy that his competition is affected contrary to law.

It seems advisable to quote here the summary concluding paragraph in that decision:

"We decide only that trade associations or combinations of persons or corporations which openly and fairly gather and disseminate information as to the cost of their product, the volume of production, the actual price which the product has brought in past transactions, stocks of merchandise on hand, approximate cost of transportation from the principal point of shipment to the

Nathan B. Williams

points of consumption as did these defendants and who, as they did, meet and discuss such information and statistics without, however, reaching or attempting to reach any agreement or any concerted action with respect to prices or production or restraining competition do not thereby engage in unlawful restraint of commerce."

This has been vitally exemplified in the more recent decision of the Supreme Court of the United States determined during the past month in the case of Anderson vs. Ship Owners Association of the Pacific Coast, which was on a demurrer which had dismissed the bill below. The court in remanding the restoration of the case to the docket of the lower court said:

"Taking the allegations of the bill at their face value, as we must do in the absence of countervailing facts or explanations, it appears that each shipowner and operator in this widespread combination has surrendered his freedom of action in the matter of employing seaman and agreed to abide by the will of the associations. Such is the fair interpretation of the combination and of the various requirements under it, and this is borne out by the actual experience of the petitioner in his efforts to secure employment. These shipowners and operators having thus put themselves into a situation of restraint upon their freedom to carry on interstate and foreign commerce according to their own choice and discretion, it follows, as the case now stands, that the combination is in violation of the Anti-Trust Act."

In another vital case, that of the United States vs. Brim, generally referred to as the Chicago Mill Work Case, forty-one defendants had been convicted in the Circuit Court, involving an agreement and conspiracy between manufacturers of mill work contractors and trade union officers to exclude from that market all products that have been made from non-union labor outside of that city. Twenty-six of those convicted appealed to the Circuit Court of Appeals and their conviction was set aside. This decision of the Circuit Court of Appeals was reversed by the Supreme Court of the United States in the opinion rendered November 23, 1926. This unlawful competition was the result of an agreement between the three parties in interest to close the market of Chicago against non-union made materials; that this competition included Illinois-made materials as well as those made outside of that state did not condone the crime of restraining interstate commerce through such competition. The court said:

"The non-union mills outside the city found the Chicago market greatly restricted or destroyed; the price of the buildings was increased; and, as usual under such circumstances, the public paid excessive prices."

There now remains on the docket of the Supreme Court only about three cases of vital importance as respects organized business activity. The first of these is that of the Claire Furnace Co. vs. the Federal Trade Commission, which involves the right of the commission to require, under the circumstances, all the detailed information as to steel and related products. The case is of high up importance in respect to the principle involved. (*Continued on page* 100.)

* Associate Counsel, National Association of Manufacturers.

FUTURE DISPOSITION AND CONTROL OF OUR PUBLIC LANDS

We Have Already Gone Far Afield In Permanently Fixing Bureaucratic Control Over Vast Resources Of West—There Should Be No Further Extension Of This Character Of Control —No Good Argument Can Be Advanced For Extension Of Such Control

By HON. F. W. MONDELL *

FROM almost the beginning of our history—at least from the beginning of that early period when our people began to make settlement outside of the borders of the Thirteen Original States, in which there were no public lands—questions relating to the disposition of the public domain have been among the most important of the Nation's problems. Beginning with the theory and practice of the sale of public lands at a low or nominal price, and in the main without regard to their character or content, we adopted during the Civil War period the policy of disposing of public lands by preemption and homesteading. Gradually after this period the policy was developed of disposing of public lands by classification as mineral, coal-bearing, etc., and with a view of encouraging certain classes of development as in the case of the desert and timber claim acts. There were also generous grants made to the states and for the encouragement of railroad building.

All of these laws and all of these policies were enacted and pursued with a view of passing the public lands into private ownership and control and for the purpose of ultimately thus disposing of the entire public domain. This purpose and policy was pursued until the comparatively recent past, with the result that while there are a few hundreds of scattered acres of public land in a number of states and a few thousands of acres in a number of other states all so poor that no one seems to want to own them, there are only eleven states where there are sufficient areas of public lands to present a real problem of public land disposition, management and control. Those states are Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming. Minnesota and North and South Dakota also have a few hundred thousand acres of public lands.

The total area of unappropriated and unreserved public lands outside of Alaska is something over 196,000,000 acres of which nearly all is in the fourteen states to which I have referred. This is an area of about 305,000 square miles. It is considerably more than the area of Texas. It is four and a half times the area of all New England and about seven and a half times that of Ohio.

The policy of conveying the public lands to settlers and of granting it to railroads or to the states with a view of its being disposed of to settlers continued with little variation down to the time of the creation of the first forest reserves in 1892, since which time there have been and now remain reserved as national forests, approximately 159,000,000 acres or about 220,000 square miles. It will be noted that this is a larger area than the unappropriated and unreserved lands. The lands in the forest reserves which may be proven to be valuable for metalliferous minerals are still subject under certain restrictions to location and entry under the mining laws and in a limited way to settlement under the homestead laws.

Hon. F. W. Mondell

Of the unreserved and unappropriated lands those chiefly valuable for coal, oil and certain other non-metalliferous minerals are retained so far as their mineral value and content is concerned permanently under the supervision and in the ownership of the Federal Government under the leasing acts. It follows, therefore, that of the unappropriated and unreserved lands there are millions of acres that can no longer pass into private ownership unrestrictedly. The non-metalliferous minerals which they contain are permanently retained in Federal ownership and under Federal management and control and the surface is retained so far as may be necessary for the extraction of the minerals.

The main features of the public land situation are, therefore, about as follows: While the major portion of the original public domain has passed into private ownership, vast areas in some eleven states and considerable areas in several others are held permanently under direct ownership and active supervision of the Federal Government, as in the case of the forest reserves, with some limited rights on the part of the citizen to obtain ownership. Other large areas (the exact acreage of which can not be determined) of the so-called unreserved and unappropriated public domain are held permanently in public ownership so far as is necessary to utilize and dispose of their Government retained minerals. The remainder of this unappropriated and unreserved area is still subject to disposal under various acts with a view of ultimately passing the lands into full private ownership and control.

The problems of this situation are roughly divisible into two parts: first, those that pertain to the administration of the permanently reserved areas like the forest reserves (particularly as they affect grazing control and mineral development), and of the lands reserved not by areas but by description of their mineral content; and, second, those that relate to the disposition of the unappropriated areas including the surface of at least a portion of the lands which may contain minerals that come under the Federal leasing act.

In their effect on the interests of the American people these problems fall into two general categories. The one relates to their bearing on questions of local government, of taxation, of political development; the other to their influence or effect on the acquisition and development of public lands and the agricultural and industrial development of the country.

I take it for granted that there is no very great difference of opinion as to the wisdom of maintaining a national forest reserve policy. The importance of reserving rough and mountainous areas with a view of increasing their timber production and conserving moisture by the protection of watersheds is so generally recognized that in view of the interstate character of the areas and of the interests to be served, it is generally

* Attorney at Law. Former Congressman from Wyoming. Former Member War Finance Corporation.

agreed that the national forest policy is essential and should be continued. The character of the administration of the national forests is, therefore, a matter of the utmost importance.

As to the reservation by the Federal Government of the coal, oil, phosphate and potash which may be known or found to exist in the lands of the public domain, while there is not as unanimous an opinion as to the wisdom of the present policy as there is in the case of the forest reserves, we are not likely to change or modify that policy until and unless it shall be demonstrated that the satisfactory development of the Nation's resources can not be successfully accomplished under the difficulties and delay which necessarily attend a long-distance bureaucratic control.

As to the remaining non-mineral public lands useful in the main only for grazing or for cultivation in comparatively small areas in connection with grazing operations, none of the reasons or arguments which have led to the creation and maintenance of permanent forest reserves or the permanent reservation of coal and oil lands apply, and there is no reason why we should not continue to dispose of them as we have disposed of our public lands in the past, with a view of having them pass into private ownership and find a place on the tax rolls of the counties and the states in which they are located. The fact that they are of comparatively little value, that the settler is slow in making an effort to acquire them under our present laws, that he does not always utilize them to the best possible advantage immediately upon acquiring title is no argument for their permanent retention but rather a convincing reason for liberalizing the land laws so that these remaining tag ends, scattered and isolated, rough, broken and desert areas, may be acquired and controlled in economic units, thus becoming a part of the taxable area of the states in which they lie and subject to that individual interest which alone results in the utilization of such lands to the best advantage.

The discussion of these questions not only involves the consideration of the basic principles of our form of government, of the relation of the states of the union to each other and to the Federal Government, but also the consideration of the world-old problem of local vs. centralized control. As bearing upon this feature of the situation, may I quote a brief paragraph which I think sums the matter up in the most concise manner in which I have ever heard it stated; it is as follows:

"No method of procedure has ever been devised by which liberty could be divorced from local self-government. No plan of centralization has ever been adopted which did not result in bureaucracy, tyranny, inflexibility, reaction and decline. Of all forms of government, those administered by bureaus are about the least satisfactory to an enlightened and progressive people. Being irresponsible they become autocratic, and being autocratic they resist all development. Unless bureaucracy is constantly resisted it breaks down representative government and overwhelms democracy.

> ***"We have already gone far afield in permanently fixing bureaucratic control over large areas and vast resources of western states. There should be no further extension of this character of control if these states are to retain in any considerable degree the elements of sovereignty over the major portions of their area."***

It is the one element in our institutions that sets up the pretense of having authority over everybody and being responsible to nobody."

Coming from the West as I do and having at one time and another stressed rather vigorously my opinion of certain policies touching the public domain, I am glad that this statement comes from very high authority and from one who has not personally or by local contact experienced the handicaps and hardships of which people in the public land states sometimes bitterly complain. It is an expression of wisdom out of a thorough understanding of the workings of certain forms of administration rather than the expression of one who has lived among the problems

> ***"There is no good argument for extension of such permanent control over the grazing lands or over the metalliferous deposits of our reserved and unreserved areas. We still need the aid of the prospector in locating and developing our mineral resources and of the pioneer in improving and utilizing our remaining lands."***

of long-distance control which are to the people of the public land states a matter of every-day experience.

The statement that I have quoted was made by Calvin Coolidge, President of the United States, in a speech delivered at the College of William and Mary, Williamsburg, Va., on May 15, 1926. I commend this clear concise statement of a profound student of government, who is not given to exaggeration, to those who are disposed to feel that those who live among public land problems are sometimes unreasonable in their view and their statement of the effect of bureaucratic control.

I have no more thought than had the President of the United States in giving utterance to the sentiment that I have quoted to criticise individuals. I have had a rather unusual opportunity to know and to judge of the personal acts and attitudes of Federal officers in connection with the administration of public land laws and policies, and I have found little to complain of at any time as to the purpose and intent of these men. I am glad to bear witness to the fact that in my opinion we have never had public officials more conscientious, more desirous to avoid delay and to deal justly than those who now have these matters in charge. It is not at all a matter of the individual; it is the question of a system, and while conditions would, of course, be infinitely worse under officials less devoted and less qualified by training and character for the proper discharge of their duties, after all, there are faults inherent in the system which neither earnestness of purpose nor good intentions can wholly overcome.

Of late there has been considerable influence exerted in certain quarters for the further extension of permanent public control and the establishment of a policy which would probably result in retaining vast areas of the lands now unappropriated and unreserved in permanent Federal ownership by establishing a system of Federal grazing control and a considerable number of well-meaning people have either urged such a plan and policy or given their approval to it. As I have stated, none of the reasons and none of the arguments which have influenced or justified the permanent Federal ownership, supervision and control of other areas apply to these lands. The policy if put into full force and effect would establish a condition under which a considerable number of the states of the Union would find themselves permanently without the power to tax and without complete authority to even police a major portion of their areas. Such a system would destroy that equality in the sisterhood of states which is guaranteed by the Constitution and has been sustained repeatedly by the courts.

Certain agencies and influences have also been to work, not always openly but nevertheless quite diligently, in an effort to retain lands, reserved and unreserved, which may be found valuable for metalliferous minerals in permanent Federal ownership, supervision and control similar to that established over certain non-metalliferous minerals under the Leasing Act. If there is any good reason for such a change or modification of national policy I have not heard it stated. In behalf of this movement it has been urged and insisted that the laws relating to the acquisition of metalliferous mineral lands are imperfect and unsatisfactory. If this be true and so far as it may be true, the remedy lies in the

improvement in law and practice rather than in a change of policy from one which contemplates private ownership and control to one which would greatly and unwisely enlarge permanent Federal control over the development of the resources of the states.

The wisdom of our national policy of private ownership and development of lands and resources, a policy which has had full play over the entire area of more than three-fourths of the states of the Union, is abundantly demonstrated by our amazing growth, progress, prosperity and development. That conditions have justified a modification of this policy with respect to certain classes of lands in some sections of the country there can be little question. The national parks and the national forests are, for instance, outstanding examples.

When, however, the policy of permanent Federal ownership and control is extended beyond the need for preservation of areas and is extended to administrative control of the development and utilization of resources, we are getting on questionable ground. This, however, may be justified and in certain instances appears to be essential, as for instance in the case of lands which control water power development.

It should be remembered, however, that we eventually reach a point in the extension of policies of this character where permanent national ownership and control is entirely out of harmony with our governmental system, with our basic principle of self-government. President Coolidge stated the matter very strikingly when he said in the paragraph I have quoted: "Unless bureaucracy is constantly resisted it breaks down representative government and overwhelms democracy."

Under a system of bureaucratic control we easily reach a point where the cost of administration is excessive, where exasperating and almost intolerable vexation and delay, the unreeling and untangling of red tape, the hampering, retarding and discouraging effects of bureau rule and regulation far outrun and outweigh any possible public benefit or advantage.

We have already gone far afield in permanently fixing bureaucratic control over large areas and vast resources of the western states. There should be no further extension of this character of control if these states are to retain in any considerable degree the elements of sovereignty over the major portion of their area. I can think of no good argument for the extension of such permanent control over the grazing lands or over the metalliferous deposits of our reserved and unreserved areas. We still need the aid of the prospector in locating and developing our mineral resources and of the pioneer in improving and utilizing our remaining lands. Speaking of the situation generally and without the thought or purpose of criticising any individual or agency, I may, I think, be justified in expressing the hope that we shall gradually have less rather than more of what President Coolidge refers to as "the one element in our institutions that sets up the pretense of having authority over everybody and being responsible to nobody."

> ***"No method of procedure has ever been devised by which liberty could be divorced from local self-government. No plan of centralization has ever been adopted which did not result in bureaucracy, tyranny, inflexibility, reaction and decline. Of all forms of government, those administered by bureaus are about the least satisfactory to an enlightened and progressive people. Being irresponsible they become autocratic, and being autocratic they resist all development. Unless bureaucracy is constantly resisted it breaks down representative government and overwhelms democracy. It is the one element in our institutions that sets up the pretense of having authority over everybody and being responsible to nobody."—Honorable Calvin C. Coolidge.***

TASK OF JOINT COMMITTEE ON TAXATION

(*Continued from page* 93)

The taxpayer is entitled to a prompt and final determination of his tax liability.

I have already outlined a plan by which final determinations may be expedited. The taxpayer should not be subjected to unreasonable delays, an expensive course of procedure, or arbitrary assessments.

Gross abuses of the use of administrative authority can be found where arbitrary additional assessments have been made without a scintilla of evidence upon which to base such assessments and without a single thing in the records of the income tax unit upon which to base a conclusion that the returns were in error in any respect.

If the government were compelled to establish prima facie the correctness of the additional assessment either by showing an error in the return or a discrepancy in the taxpayer's books, or by the production of undisclosed facts affecting any of the factors involved in the determination of net income, the iniquitous practice of arbitrary assessments would automatically largely disappear.

The income tax law should provide for the refund of taxes paid in all cases where the decision of the Commissioner is reversed by the Supreme Court of the United States, or by a decision of a lower Court when an appeal is not taken and final judgment is rendered in favor of the taxpayer, regardless of any statutory limitation except a limitation requiring taxpayers affected to file their claims within six months after publication of the decision in the Internal Revenue Bulletin or the Official Court Reporter.

The failure of Congress to enact such a provision operates to penalize the taxpayer who relies upon Treasury authority and pays his taxes without thought of contest, and to reward the taxpayer who defies Treasury authority. The former may be more deserving but less able to stand the expense of litigation. Simple justice would seem to be the only argument needed to secure the relief. The Treasury has, of course, opposed it, and will continue to do so.

With respect to the personnel of the Bureau of Internal Revenue, the Joint Committee might well consider the sufficiency of salaries paid.

It costs somewhere near thirty-five million dollars annually to run the Bureau. It is conceded by everyone familiar with the situation that its efficient technical staff is grossly underpaid. Men considered qualified for assignment as engineers and conferees in the largest mining or manufacturing cases, involving millions in taxes, receive salaries so small in comparison with the service they are rendering that it must be only devotion and loyalty to the public service that keeps them from attempting to market their abilities in the business world.

Fewer employees and higher salaries to the key men in the revenue service with the prospect of ultimate advancement for the subordinate might help to secure greater efficiency throughout the service. Certainly, with relief from financial worries and with an income sufficient to live somewhat in keeping with the responsibilities of their positions, employes of the Bureau could face the taxpaying public with greater confidence and more of a disposition to be fair, and to approach doubtful points in the spirit of compromise. Adequate increases in salaries, wisely apportioned, might work wonders with this Bureau which constantly is X-raying the taxpayer's pocketbook and demanding a share of his bank account.

WHO SHOULD CONTROL OUR PUBLIC LANDS WHICH CONTAIN MINERALS

United States Should Cease To Control Such Lands And Minerals And Should Cede Them Absolutely To States In Which They Are Located—Government Should Get Out Of Landlord Business And Permit Western States To Enjoy Full Measure Of Equality

By W. HALVERSON FARR *

MY talk would be very brief indeed, if confined to a categorical response to the query: "Who should control our public lands which contain minerals?" for it seems very plain to me that if lands are public lands, the control of them, and the minerals they contain, is necessarily in Congress by reason of the provision in the Constitution that "Congress shall have power to dispose of and make all needful rules and regulations respecting the territory or other property belonging to the United States. Obviously the power of disposal includes the power of control; hence, if I supposed it was expected of me to reply in a manner that took account only of the literal construction of the query, I would be constrained to state that the United States not only should but must have control over such lands and the minerals therein.

But, of course, those who framed the interrogatory sought more than a mere legalistic answer to it. They undoubtedly desire to know what, in my opinion, would be a mode of control prescribed by Congress that would best promote the public interests in the public lands. As I have said before, the power of disposal includes the power of control. In my judgment the United States should cease to control such lands and such minerals and should, through an exercise by Congress of its power to dispose of them, cede them promptly and absolutely to the several states in which they are located. A very radical suggestion, some of you may say—perhaps it is—but it is not a novel one. It has been made and debated over a considerable period of time and, as I think, now is the time for some action by Congress with respect to it that will be definite and final as disclosing whether the legislative department of the Government purposes continuing the United States as the proprietor of more or less huge areas of real estate situated in the several states.

We all know that the public lands never were the lands of the United States, i. e., the United States never was the owner thereof. Such lands were always the peoples' lands. From this fact is derived their description as public lands. By their Constitution, however, the people made Congress their trustee of such lands by vesting in Congress the power of disposal thereof. These are not novel ideas. They are but pariphrases of utterances of the Supreme Court of the United States, for that Court has repeatedly enunciated the doctrine that with respect to the public domain the relation of Congress is solely that of a trustee for the people. And that doctrine, of course, is

> ***"Any spirit of hostility to legislation which would tend to put western states upon equality with rest of states of Union is the child of ignorance, and the lack of proper understanding of facts, or is the product of paternalistic government and bureaucracy carried to the extreme."***

founded upon that concept of government upon which the fathers established the Republic of the United States of America, namely, that all the powers of the Government of the United States, as well as all the property that has come into its custody proceeded exclusively from the people. The people very rightly endowed the United States when they empowered Congress to dispose of the public domain. The endowment has been increased and enriched since adoption of the Constitution in 1789. However, I shall not recount the events in our national history that eventuated in the enhancement of the endowment by the empire we acquired from France, the huge domain that came to us from Mexico and the territory that was ceded to us by Spain. Nor will I dwell at all on the manner of discharge of the functions of Congress as a trustee of the public domain prior to the year 1900 which, as I think, marks the inception of what I shall term the period of the policy of conservation of the people's lands and the people's resources thereto and therein. I am a conservationist and, as I think, so is every citizen of the Republic who takes any thought of its future and of the welfare of the people thereof. But there are several types of conservationists. There is that type that professes to believe that conservation is possible only through agencies of the Federal Government. I believe that conservation is not only feasible but can be more scientifically and efficiently accomplished through state governmental agencies. A great fallacy, in my judgment, inheres in the idea which is so often expressed that conservation can best be advanced through congressional legislation and, therefore, that it is expedient in the public interests that Congress cease disposing of the public lands and make permanent a policy of retention of title thereto in the United States for the purpose of control of the lands and the minerals therein as directed by Congress and through administration thereof by Government departments and bureaus at Washington.

> ***"In the development of the natural resources of a state lies its bid for prosperity and reduction of taxation. No state has ever prospered to any extent so long as its natural resources were allowed to lie dormant. Any policy adopted and followed by a state or government which prevents or hampers private ownership is detrimental to the interests of that state or government."***

If the Government retains control of the minerals and remains forever vested of title, who can estimate the loss in revenue from taxation that will be suffered by the states where these natural resources are located?

Some there are, including the Government, who seem to think that the resources of the West belong to the people of the United States as a whole, and they attempt to use this as an argument against state control. If this be true and the natural resources of this United States belong to the people of the United States as a whole, if this be a sound doctrine of long duration, then I say it is pertinent to the issue to here ask why this same policy was not applied to the states in the East? Why did not the Federal Government apply the same policy there that it now attempts to apply to the West? Why make fish of one and fowl of another? If those in the East are entitled to share in the natural resources of the West, why should not

*Assistant Attorney General, State of Utah.

the converse of that rule be applied with equal force?

The eastern states have never been able to fully grasp the situation that confronts we people of the West. They retained unto themselves all the lands within their borders, minerals and all, and as a result they have reaped a golden harvest; and why should they now begrudge us a few crumbs from the same table? Any spirit of hostility to legislation which would tend to put the western states upon somewhat of an equality with the rest of the states of the Union is the child of ignorance, and the lack of a proper understanding of the facts, or is the product of paternalistic government and bureaucracy carried to the extreme—federalism in its most offensive form.

Why should the Government insist on adopting and pursuing a policy which not only prevents the states of the West from enjoying that full measure of sovereignty enjoyed by the eastern states? Why should it continue to treat them as a vassal rather than a sovereign?

In the development of the natural resources of a state, lies its bid for prosperity and reduction of taxation. No state or country has ever prospered to any extent so long as its natural resources were allowed to lie dormant, so I say that any policy adopted and followed by a state or government, which prevents or hampers development, which prevents or hampers private ownership, is detrimental to the interests of that state or government, and while it may have been conceived honestly it is none the less short-sighted and unwise.

Those of us who believe that the interests of all the people could and would be best subserved through cession of the lands to the states, are frequently told that the rather general satisfaction which is evinced with respect to the national forest system is demonstrative of the soundness of the argument that conservation through control of the Federal Government has been successful in every way. It is true that the National Forest system, as now administered, does not disclose any very convincing proof that discontinuance of it would be salutary. However, those of us who know anything of the history of the national forest system, realize that its present acceptability to the people of the states wherein the forests are located is not due to an application of the ideas of those whom I shall characterize as Federal conservationists, but is due to the enforced recognition by Federal conservationists of the necessity of conforming their administration of the national forests to the demands with respect thereto made by the people of the states and to which the Federal conservationists, contrary to their own ideas of conservation, have been compelled to yield and conform. In other words, Federal conservation of the national forests is in fact state conservation thereof, for the Federal administrators of the national forest system have been constrained to adjust their mode of administration so as to serve those very economic interests of the state which would be served by them if the lands in the forest reserves were in their ownership. And I think it must be apparent to those of you who reside in the western states and have any knowledge of national forest administration, that such

> ***"If a commonwealth is really entitled to membership in the Union of States, it is also really entitled to enough of the confidence of the entire United States to be permitted to have and to exercise ownership and dominion over all the territory within its boundaries, at the expense of the state and consistently with whatever policy may, in the judgment of its legislature, be best calculated to promote the interests of the state."***

administration is, in effect, the conduct and management of a matter of legal concern by the United States and at its expense, instead of by the states and at their expense.

If a commonwealth is really entitled to membership in the union of states, it is also really entitled to enough of the confidence of the entire United States to be permitted to have and to exercise ownership and dominion over all the territory within its boundaries, at the expense of the state and consistently with whatever policy may, in the judgment of its legislature, be best calculated to promote the interests of the states. The original thirteen states have not shown by their management of what were public lands therein a tendency to disregard the interests of the people with respect thereto. It can not be shown that the commonwealth of Texas was prejudiced by its admission into the Union under terms that preserved to that commonwealth exclusive ownership and dominion over all the territory within its boundaries. Nor

> ***"The time has come when this government should get out of the landlord business and cease being an absentee landlord of our public domain. It is time that the sovereign states of the West be permitted to enjoy the same measure of equality enjoyed by the other states. It is time that this sovereign United States should look upon the states of the West with eyes of confidence."***

can it be established that the rapid development and increase in population of the region west of the Mississippi river were due entirely, or even largely, to the character of the public land legislation of Congress. That legislation did not create the farms, or the ranches, or the mines that enriched that section. Such legislation merely brought within the sanction of the law a settlement, and a development, that were already in progress. And so it has been with respect to the legislation of Congress concerning the minerals in the public domain. That legislation never sank a shaft, nor drove a tunnel, nor drilled a well. It was responsive to a demand by those who had gone upon the public domain, long in advance of legislation relating to the minerals therein, and made the discoveries and developments that resulted in the production of minerals. Nor has such legislation of Congress given any stimulus whatever to the production of minerals. The production of minerals is the result of the operation of economic laws and is in no wise traceable to the laws of the legislative bodies. But an unfounded fear prevails in some quarters that unless Congress continues to control the minerals in the public domain, something highly prejudicial must inevitably result to the public welfare. And this unfounded fear is actually engendered and heightened by the type of conservationists whom I have described as the Federal conservationist. However, every person conversant with the subject knows, if he knows the history of the public domain during the past 25 years, that the only effect of Federal legislation with respect to the minerals in the public domain has been to hinder and retard rather than facilitate the production thereof.

The prevalent and mistaken belief that the mineral resources of the public lands can best be developed under Federal control has given rise to a situation in the administration of grants of lands to the states for educational purposes that has very greatly impaired the value of those grants and withheld from the states the benefits they were intended to confer. Although all such grants were made more than a generation ago some of them remain unadjusted and unsatisfied to a very large extent. What has caused this intolerable condition with respect to those grants is the virtual change, not in law, but in the decisions of the Department of the Interior with respect to what is meant—or comprehended—in the exception of mineral lands from such grants.

It has been repeatedly affirmed by the Supreme Court of the United States that only lands known to be mineral in character are withheld from the states under such grants. But notwithstanding such

adjudications by the highest tribunal in the Nation, the Department of the Interior, the agency of the Federal Government empowered to administer the grants, has taken positions in matters of law that are entirely contrary to the announcement of the Supreme Court of the United States. For instance, that department insists that the many withdrawals of lands, which were made as long ago as 1909, in order to preserve such lands in the public domain until Congress should have enacted legislation with respect to the disposal of the oil and gas, if any, in them, are still existing withdrawals of a character that constitute a reservation of such lands from the operation of the school grants on them, notwithstanding the fact that the purpose for which the withdrawals were made has been achieved and fulfilled by the enactment of the leasing statute of February 25, 1920.

This means, of course, that all sections of land designated in the school grants to the states that are situated within the exterior boundaries of such withdrawals, can not be leased or sold or otherwise used or disposed of by the states for the benefit of their public school systems. Another of the obnoxious attitudes of the Department of the Interior is the one that the states are not entitled under such grants to any lands which, in the opinion of a geologist, might be shown to contain coal or oil or gas at depths varying from 500 to 5,000 feet. In other words, the Interior Department has asserted, contrary to Supreme Court opinions, that it is not the known character of the land that is the standard by which to judge whether it is excepted from a school grant, but the approximation, conjecture, surmise, or guess of a geologist that such land might be shown, after prospecting, to carry mineral, that is the criterion for judgment as to whether the state or the United States owns the land. Instead of receiving the lands granted, the states are receiving only an expensive experience in litigation with the Department of the Interior over the grants, and this is a consequence of Federal control of the minerals in the public domain. If there existed any well founded reason for supposing that in event the public lands were conceded to the states absolutely the public interests would suffer by unwise administration by the states of the minerals contained in such lands, there would exist cause in law and in common sense for the present situation. But as neither the history of state lands, nor the attitude of the enlightened people in the western commonwealth furnish warrant for any such supposition, the Federal control to the extent just described has certainly been antagonistic to the public interests rather than of any benefit thereto. Speaking for myself I answer the question addressed to me by saying that Federal control of the public lands should terminate and that by an act of cession of those lands to the states Congress should manifest confidence in the people thereof to develop the mineral resources within their commonwealth consistently with the public will and the highest interests of the country generally.

I feel that the time has come when this Government of ours should get out of the landlord business and cease being an absentee landlord of our public domain. It is time that the sovereign states of the West be permitted to enjoy the same measure of equality enjoyed by the other states. It is time that this sovereign United States should look upon the states of the West with eyes of confidence rather than mistrust. And I say it is time that this Government of ours should begin to realize that no truer words were ever spoken than "In the education of its people lies the safety of the Republic"; and realizing this, it should adopt a liberal policy and turn over to those states the control of the minerals particularly in school section lands and let education reap the benefit. The adoption of such a policy can not be justly criticized, and a failure to adopt such a policy can not be defended.

SENSIBLE APPLICATION OF ANTI-TRUST LAWS

(*Continued from page* 94)

A very difficult case is that of the United States vs. the Trenton Potteries Co.

Some important principles in respect to consent decrees are involved in the case of the United States vs. Swift & Co., the decree being that as obtained in the District of Columbia with respect to the Packers dealing in canned food products. Then there is the case of the United States vs. the International Harvester Co., wherein the United States is attempting to have the Supreme Court find out whether the farm machinery manufacturing business is unlawfully dominated by this large industrial unit.

For many years very active efforts have been made by certain groups to have legislation enacted which will enable the manufacturer of branded or trademarked goods, to contract with the dealer and fix the price at which such might be sold at retail to the consumer.

The Supreme Court in numerous decisions has pointed out that the manufacturer has a complete right to sell or to refuse to sell to dealers for any reason satisfactory to himselr or to *independently* take such course of action as seems wise when any such dealer fails to cooperate with the manufacturer in his sales policy. This has been so decided repeatedly by the Supreme Court in cases coming before it and in cases wherein it has refused orders of the Federal Trade Commission that the correct principle of law is now no longer capable of doubt and ought to be now, thoroughly understood.

Another angle of this same question was very clearly presented by the Supreme Court in its decision of November 23, 1926, in the case of the United States vs. the General Electric Co., wherein the court said:

"The owner of an article patented or otherwise is not violating the common law or the anti-trust law by seeking to dispose of his articles directly to the consumer and fixing the price by which his agents transfer the title from him directly to such consumer."

Business men drawn in under the diversity and multiplicity of legislation can well afford to withhold all further efforts along this line. Another group of cases decided by the Supreme Court on November 23 were those involving orders of the Federal Trade Commission calling upon the respondents to divest themselves of the properties of other companies acquired by the respondents alleged to be in violation of Sections 7 and 8 of the Clayton Act. In the case involved, the Western Meat Co. had a share of the capital which had been acquired by the respondent, but the corporate integrity had been maintained. In the other case, that of the Thatcher Co. and Swift & Co., the physical assets of the companies had been acquired before proceedings had been commenced by the Federal Trade Commission. In the first case, the order of the Federal Trade Commission was upheld and in the other two cases, it was reversed. The court points out that the commission has no authority to require one who has secured actual title and possession of the physical property before proceedings were begun against it, to dispose of the same although secured through an unlawful purchase of stock.

It thus becomes apparent that a sensible application of the anti-trust law is to be accomplished by the constant vigilance of established business activity. The individual man is helpless against trained personnel backed by public money. There was an eminent French philosopher, Alexis de Toqueville, who, in discussing what sort of despotism democratic nations have to fear, announced the antidote in the most picturesque charter ever written for organized business activity. He said:

"An association for political, commercial, or manufacturing purposes, or even for those of science and literature, is a powerful and enlightened member of the community, which can not be disposed of at pleasure, or oppressed without remonstrance; and which, by defending its own rights against the encroachments of the Government, saves the common liberties of the country."

I commend these, his thoughtful words and his vigorous fighting spirit as worthy of your most amiable emulation.

FEDERAL DOMINATION VS. STATE SOVEREIGNTY

Forest Reserve Act First Step In Government By Regulation—Although Constitution Lodges Full Legislative Power In Congress That Body Has In Public Land Matters Delegated Its Authority To Cabinet Officers

By CHARLES L. GILMORE*

THE first act of Congress to violate the theory of disposal of the public lands was the act of March 1, 1872, creating Yellowstone National Park. The older states had received the benefit of the earlier public land laws which had been enacted according to the theory of sale agreed upon during the formative period of this Republic. Under those laws, Congress had disposed of the public lands in those states. When this theory of reserving the public lands from sale and disposal permeated Congress, that body took on the nature of a ship without a rudder. It violated all the earlier agreements and compacts between the states, between the states and the Federal union, and the decisions of the Supreme Court of the United States. That body had expressly determined that the United States did not have any "municipal control or sovereignty" over the public lands. Further, Congress violated the oft enunciated theory of equality of states.

If the older states had received the benefit of the public land laws and all public land within them had been disposed of and so brought under local and state taxation, could equality exist when the United States refused to the newer states the same right and privilege? If every new state comes into the Union upon terms of absolute equality with all other states, such equality can not exist if in one state the Federal Government exercises sovereign powers over the lands, while in another it has disposed of such lands, or in the execution of its trust it must dispose of them, and in another it has not attempted to exercise any control or authority over any of the public lands. Perhaps the United States Supreme Court will, some day, explain the apparent inconsistency and hostility, as well as direct conflict that exists in the various laws of Congress relating to the public lands as well as in its own decisions between public land statutes on the one hand and other statutes in derogation of the sovereignty of the states on the other.

THE CROWNING INEQUALITY

On March 3, 1891, the President approved an act of Congress known as the "Forest Reserve Act." This bit of legislation is the most glaring violation of the plain terms of the constitutional guaranties of the sovereign rights of the states ever perpetrated by the Congress. It not only violates the Constitution, but it violates the Declaration of Independence, and is contrary to the rules established by the Supreme Court of the United States. It authorizes the President of the United States to create, at will, new states within the borders of existing ones, by *refusing to dispose* of such lands.

California was admitted into the Union on September 9, 1850, as a sovereign state. It had already set up a state government, adopted a constitution, elected a full quota of state officers including representatives to Congress. These representatives were despatched to Washington to hurry along the proceedings whereby California would be a state in fact. Thus, while the opportunity offered, this state did not set up an independent government as did Texas, but chose rather to be and become one of the United States directly as a state. California never was a territory and never had a territorial government. In fact, Congress never enacted a statute relating to California until September 28, 1850, or nineteen days after the state became one of the Union.

This is the second article in the series being prepared by Mr. Gilmore on the Public Lands question. We present these articles as expressing the viewpoint of many western men, but not necessarily that of this Journal. We shall be glad to hear from our readers concerning this question.—The Editors.

California was, therefore, admitted into the Union upon terms of absolute equality with the other states. While it has been judicially declared that an essential part of that equality is the disposition of the public lands within the state, to the end that revenues by taxation therefrom and the control over them may be vested in the state, we have in California a withdrawal by the United States from sale and disposal and a placing in reserves of various kinds without the consent of the State Legislature, approximately one-third of the area of the whole state—an area greater than the combined territory of New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New Jersey and Maryland. The national forests in California alone cover an area of more than 19,000,000 acres of Government-owned land, and this figure does not include privately owned land within those forests. It is, indeed, a departure from the accepted construction of the Constitution to say that the United States may, as here, withdraw from state use and control one-third of the area of a sovereign state, forever deny to the state the sovereign power of taxation and control over these lands, and develop and exploit them under its own rules and regulations for the enrichment of its own treasury.

GOVERNMENT BY REGULATIONS

In all acts of Congress relating to the public domain enacted in recent years, there has been a growing desire on the part of that body to shirk the responsibility of providing adequate legislation. Seemingly it has mired in the morass of helplessness. The statutes breathe hopeless and helpless ignorance of the simple fundamentals. Ever since the Forest Reserve Act of 1891, Congress has wallowed through a futile hodge-podge of meaningless words in an attempt to create an act relating to the public lands, then gave up the ghost and added a phrase to the effect that the Secretary of the Interior or the Secretary of Agriculture is directed to provide all rules and regulations to carry the act into effect. It has been easier to slough the proposition off by handing some cabinet officer the right to enact such legislation, under the cloak of regulations, as he may desire. I never learned from my study of constitutional law that Congress had been granted the right to delegate legislative authority to a member of the President's cabinet. Nor have I yet learned that the Constitution gave such cabinet member the right to resolve himself into a legislative body, all decisions of the Supreme Court to the contrary notwithstanding. In fact I have always labored under the very definite delusion that the Constitution prohibited with absolute certainty any such delegations of power by establishing with meticulous certainty the three separate departments of government. Section 1 of Article I of the Constitution provides:

"All legislative powers herein granted shall be vested in a Congress of the United States, which shall consist of a Senate and House of Representatives."

Then turning to Section 1 of Article II, we read:

"The executive power shall be vested in

* Attorney at Law, Sacramento, Calif.

a President of the United States of America."

Further search reveals Section 1 of Article III, as follows:

"The judicial power of the United States shall be vested in one Supreme Court, and in such inferior courts as the Congress may, from time to time, ordain and establish."

Scrambling Governmental Powers

With the passing years, however, Congress has paid little heed to the foregoing three sections of the Constitution. At any rate, the three sections above quoted have been totally ignored in every public land statute passed by Congress during the past thirty years or more. For instance, the Department of the Interior, which is vested with the control of that portion of the public domain that Congress deems wise to dispose of as well as lands included in several forms of withdrawals that Congress deems unwise to dispose of, exercises all three of the functions that the Constitution expressly defines as separate and distinct departments.

The Department of the Interior prepares and promulgates regulations relating to the public domain which have all the force and effect of legislative enactments; it exercises executive control over the public domain as an administrative organization, and, finally, it judicially determines and declares the validity of its own legislation and the extent of its own executive authority by means of its own judicial officers, which are separate and distinct entities from the regular, constitutional judicial officers.

Within itself it operates as judge, jury, prosecuting attorney and appellate court, and the hapless individual who is so unfortunately situated as to run foul of its judicial system soon learns the necessity of keeping the three divisions of government separate and distinct in all affairs of a liberty-loving people.

A Radical Change

From 1841 to and including at least 1911, the Supreme Court insisted upon the theory that each state came into the Union upon terms of absolute equality with the others, and that it was beyond the power of Congress to impose any condition upon a new state as a price of admission that was not imposed upon all the others. However, we find that this rule does not apply in all matters of Federal interference, nor in all constitutional concerns.

Shortly after the enactment of the Forest Reserve Act, the Supreme Court was called upon to determine the power of Congress to refuse to dispose of the public lands in the newer states. That Court promptly decided (Camfield vs. United States, 167 U. S. 524) that in the execution of the trust, it was within the power of Congress to sell or withhold from sale any of the public lands within the several states. The word "dispose" is given a new meaning in that case. Where the Constitution says "dispose" the Court defines the word as meaning "to retain." In other words, if you arrange for the "disposal" of your farm, it does not mean that you are to deprive yourself of the possession or right of possession. You merely rent it out so as to obtain some income from it and quit paying taxes on it. In the meantime it is your property and subject to your sole control every instant of time.

When Congress violated the Constitution in creating the Forest Reserves, and thus created new states within the confines of old ones, it was necessary to create a brand new lot of laws and a brand new lot of officials. Congress knew as much then as it does now about the sparsely settled western country, and had no more time then than it has now to legislate intelligently regarding that territory. So it enacted another one of its "regulation" statutes and granted a cabinet officer the authority to make such laws as he might deem necessary without any reference to Congress. Thus there came into existence the Forest Service Bible, otherwise known as the "Use Book," and at my last examination of the volume, I estimated that it contained approximately four hundred pages of fine print on bible paper. This book is not for general distribution, but is given to rangers and others above that rank only. If you wish to know what laws govern you in any of the 186,000,000 acres comprising the Federal barony in the eleven forest states, you must first hunt up a forest ranger and take a lesson or two in government by regulation as opposed to legislative enactment. Of course, the ranger can not ever be certain that the regulations he has are the latest, because the unseen and unknown ruler of this empire has a peculiar method of changing the regulations whenever the spirit moves him, and it takes several weeks from the date of the change at Washington for the new laws to reach this remote ranger.

Some of these regulations relate only to the administration of the forest reserves and are promulgated for the guidance of the forest service officials; but there are innumerable others that are made to control and regulate every act of every person who steps over the boundary into the sacred precincts of the forests, and these are penal in character. In other words, if you violate one of these regulations, you stand in the same predicament as you do when you violate any of the criminal statutes of the United States.

Penal Regulations

Thus you will see that some official at Washington, a man whom you did not elect, can not remove from office and whom you may never be able to see face to face and over whom the people of these United States have not the slightest control, is vested with the power of creating, at will, laws which, if you violate one of them, will cause you to sojourn in prison for such terms as a Federal judge thinks best. The Federal courts in the West, when these regulations were first created, declared them unconstitutional and discharged the persons arrested.

But in due time the Federal officials brought a case involving these criminal regulations before the Supreme Court, and that Court (United States vs. Grimaud, 220 U. S. 506) promptly decided that regulations promulgated by the Secretary of Agriculture in that manner had all the force and effect of law. Thus we are informed that Congress may, if it so desires, scramble the separate departments created and provided for in the Constitution, and delegate legislative authority to a cabinet officer.

The national forests are not the only areas governed by laws separate and distinct from the great body of statutes in force for the remainder of the country. The National Park system goes several steps further with the power of government by regulation. There is a little section of the Constitution that is entirely overlooked by the national park officials and it is contained in the second amendment to that document:

"A well-regulated militia being necessary to the security of a free state, the right of the people to keep and bear arms shall not be infringed."

This section has been in the Constitution ever since December 15, 1791—the date of ratification—but evidently it has been forgotten or else the director of the National Park Service has repealed it. The fact remains, however, that before you can gain entrance to one of these imperial sanctuaries you must surrender any and all firearms you may have on or about you. I quote from one of the National Park folders:

"Visitors entering or traveling through the park to places beyond shall, at entrance, report and *surrender* all *firearms*, traps, nets, seines, or *explosives* in their possession to the first park officer, and, in proper cases, may obtain his written leave to carry them through the park sealed." (Crater Lake National Park, 1925, page 13.)

The park official has the power to deny you a right that the Constitution grants you absolutely, and the Supreme Court says such a regulation is wholly constitutional and legal in every respect. Is it any wonder that a lawyer sometimes gets dizzy trying to brief a point involving constitutional law?

METAL MINING IN UNITED STATES IN 1926

Drop In Price Of Silver Creates Almost Universal Decrease In Value Of 1926 Mineral Output—Lead And Zinc Production Large And Copper Production Greatest Any Peace-Time Year—Gold Shows Decrease—Value Of Output Less But No Decrease In Activity Or Quality

Alaska

While value of mineral production not as great as 1925 this is result of lower price of product and not of decreased activity or quality.

ADVANCE statements prepared by the Alaskan branch of the Geological Survey state that mines in Alaska produced minerals to the value of $17,490,000 in 1926, as against $18,220,692 in 1925. The total value of the mineral output of Alaska since 1880 is over $570,000,000. The figures for 1926, which are estimates and consequently subject to revision, follow:

Value of Mineral Output of Alaska in 1925 and 1926

	1925	1926 (Est.)
Gold	$6,360,281	$6,620,000
Copper	10,361,336	9,500,000
Silver	482,495	420,000
Coal	404,617	400,000
Other minerals (lead, petroleum, marble, tin, platinum, etc.)	611,963	550,000
	$18,220,692	$17,490,000

General Conditions

Although, as shown by the preceding table, the Geological Survey estimates that the value of Alaska's mineral production was not as great in 1926 as in 1925, the decrease in value by no means indicates a decrease in mining activity or even an equivalent decrease in quantity of certain of the metals produced. Considerably more than half of the decrease in value is directly attributable to the lower price of the product, which of course was a condition in no way confined to the mining industry in Alaska. For example, in 1926 the average price of silver was 7 cents an ounce less than in 1925, the price of copper was about fourtenths of a cent a pound less, and the price of coal, lead and palladium was also less. The value of the yearly mineral production of Alaska, however, is even more significant than appears at first glance, because the ratio between this value and the estimated population of the Territory is about ten times the similar ratio for the rest of the United States. In other words, the productivity of mines plays a much more vital part in the economics of the average Alaskan than in that of the average resident of the States. Even the current reduced annual value of the mineral production from Alaska is practically 2½ times the price originally paid for the entire Territory.

Gold Creek in Southeastern Alaska

Viewed broadly, the mining conditions through the Territory are encouraging, not only for the continuation of production at the present rate but for a gradual increase. Many of the operators have important development work in progress to put their properties into more efficient working condition, and capital for this new work and for new equipment is being made available. The improvements already brought about are reflected by some increase in the production of gold, and further developments are under way that should be still more productive in 1927, though it will be several years before all these projects will have their full effect in increasing the production.

There are still large areas in Alaska that have not been adequately prospected, and many promising properties are now lying idle because of lack of capital for the necessary equipment. The shortage of enterprising prospectors is a serious drawback that has resulted because wages for comparable work are actually lower in Alaska than in the States, though expenses are higher. As a consequence Alaska does not attract or hold the class of prospectors it formerly did. The need of capital also grows more pressing as more extensive equipment becomes essential, but capital will not be attracted to Alaska unless the returns on the investment are likely to be higher

than in the States, for the greater distance of many parts of Alaska makes investments there less alluring.

Gold Placers

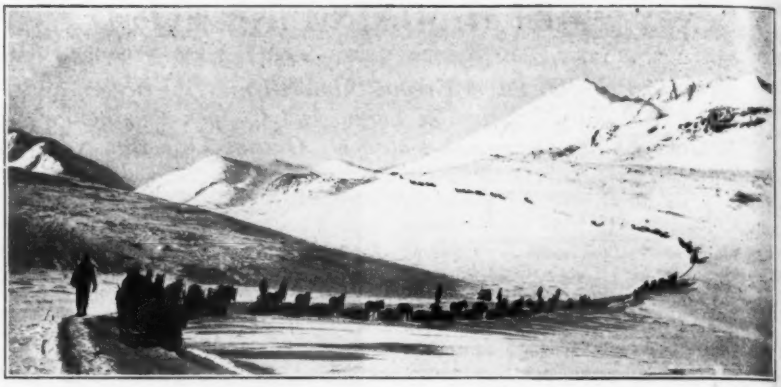
In spite of the fact that in many parts of Alaska placer mining was badly hampered by the shortage of rain the production of placer gold showed a marked increase. The most noteworthy increases were reported from Seward Peninsula, the Fairbanks district, and the districts in the upper part of the Yukon basin. The increase in placer production is attributable principally to the increased production by the dredges, and about 60 percent of the placer gold produced in 1926 was won by this method of mining. According to preliminary estimates the 29 dredges that were in operation in 1926 produced gold valued at about $2,200,000, which is somewhat more than $500,000 in excess of the amount that was recovered by this means in 1925. Among the new dredges built and operated during the year, the Nome Creek dredge, in the Fairbanks district, was the largest. The Fairbanks Exploration Co. continued to develop its extensive properties on Goldstream Creek and in other parts of the Fairbanks district. It is understood that about 17 miles of this ditch is now completed, together with some of the necessary siphons. Though much other development work was in progress by this company, the property will probably not begin productive mining on a large scale before 1928.

Although placer mining by other methods than dredging was hampered in some of the districts by lack of water until after the middle of the summer, the camps in the Fortymile, Circle, and Eagle districts, in the upper part of the Yukon basin, report that on the whole they had more and better distributed water than usual. This condition is reflected by the increase in the amount of gold they produced.

Gold and Silver Lodes

The most notable accomplishment in the gold lode mines during the year was the mining and milling of a very large amount of ore by the Alaska Juneau Gold Mining Co. in the Juneau district, southeastern Alaska. This company maintained an average production throughout the year in excess of 10,000 tons a day, and during one month averaged more than 12,000 tons a day.

All three of the hitherto productive gold mines on Chichagof Island were active, and additional prospecting in that region is reported. Mining in the Nuka Bay region showed a considerable increase and would probably have yielded even more gold had breakage of machinery not interrupted continuous operation of the mill during part of the summer. In the Fairbanks region the production of lode gold came mostly from the Mohawk and Hosiana mines, on Ester Dome, and the Crites & Feldman mine, on a tributary of Fairbanks Creek, but prospecting was carried on at a number of other properties.



A Familiar Scene in Alaska

Most of the silver produced in Alaska in 1926 was recovered from the copper ores. More than three-fourths of the silver produced during the year came from this source. A large part of the remainder was produced from the gold ores of the Alaska Juneau Gold Mining Co., and some silver was also recovered from the gold won in placers and other gold lode operations. The lead-silver deposits in the Hyder district attracted considerable attention during the year, as the ownership of several of the more promising properties was taken over by strong companies—an indication that development on them will probably be carried on more actively and under skilled management. The Riverside mine continued to be the main producer on the American side of the district, in the vicinity of Hyder. Prospecting was continued on the silver-lead lodes north of Skagway.

Copper

A considerable part of the decrease in the value of the copper produced in 1926 is directly attributable to the lower average price of copper in that year than in 1925. The output of copper was largely made by the Kennecott and Mother Lode mines, in the Copper River region, and by the Beatson mine, on Latouche Island. Among the smaller producers of copper, the Alaska Palladium Co., on Prince of Wales Island, in the Ketchikan district, had the largest output.

Coal

The production of coal was maintained in 1926 at approximately the same rate as heretofore and was furnished mainly by the Evan Jones, Alaska Matanuska, and Premier mines, in the Matanuska region, and the Suntrana mine, in the Healy River field. The Evan Jones mine was closed down in September, and the owners did not plan to operate again during the year. The Alaska Matanuska was more or less completely closed down for several months during the summer for the purpose of installing new machinery and getting the washing plant into running order. Some development work under lease or permit was also done at the Rawson mine, on Moose Creek, and on Coal Creek opposite Chickaloon. The Healy River Coal Co.'s mine was in operation throughout the year.

The controlling factor of Alaskan coal production continues to be the market, and special efforts have been made by several of the companies during the year to build up an outlet for their coal. As a result of these efforts, shipments have been made to several points as far distant as southeastern Alaska, but the largest quantity of coal continues to be used on the Alaska Railroad and in enterprises in the immediate vicinity of the railroad. Even in the area in which the Alaska coals should have decided trade advantage they have not supplanted coal from outside fields.

Petroleum

All the petroleum produced in Alaska continued to come from the wells of the Chilkat Oil Co., near Katalla, where, in addition to the oil wells, the company operates a small refinery. The gasoline and distillate produced by the company are much in demand in the local market, as they are said to be of better quality than the usual commercial brands.

The exploration for petroleum on the Pearl Creek dome in the Alaska Peninsula, which has been in progress for three years by the Standard Oil Co., was definitely suspended early in the year, when the test well was abandoned at a depth of 5,034 feet.

Drilling to test for oil the structure in the vicinity of Johnson Creek, in the Yakataga region, was carried on by the General Petroleum Co. According to the latest available information, this well had been drilled to a depth of 300 feet, and a good flow of gas was said to have been encountered at 240 feet and indica-

Concentrator of the Phelps Dodge Corporation at Bisbee, Ariz.

tions of oil at several places between the depth of 200 feet and the bottom of the well. This well to a depth of 61 feet had a 15½-inch casing, from that depth to 240 feet a 12-inch casing, and below that depth an 8-inch casing.

Examination of Naval Petroleum Reserve No. 4, in northern Alaska and adjacent regions, was continued by a party from the Geological Survey, in charge of Philip S. Smith, which went overland during the winter and spent all the summer in field work in this area.

Other Minerals

Alaska also produced during 1926 some lead, marble, tin, platinum, and palladium. Lead showed some decrease in quantity, but a large part of the decrease in the value of the output of this metal was due to the fact that the price of lead was about half a cent a pound less in 1926 than in 1925. Most of the lead was recovered in the treatment of ores whose principal value is their gold or silver content. The lead-bearing gold ores came almost entirely from the Alaska Juneau mine, in southeastern Alaska, and the lead-bearing silver ores came principally from the Hyder district, also in southeastern Alaska. The output of marble came entirely from the quarries of the Vermont Marble Co., at Tokeen, on Prince of Wales Island, southeastern Alaska. The tin ore, or cassiterite, was derived from placers near York, in Seward Peninsula, and from the Hot Springs district, in the Yukon-Tanana region. Some of the platinum metals were won from placers in the vicinity of Dime Creek, Seward Peninsula, but the larger part of the output was palladium recovered from a copper lode of the Alaska Palladium Co., on Kasaan Peninsula, in the Ketchikan district. According to current reports, the low price of palladium caused suspension of operations of this mine in October. A new mining enterprise was started on Gravina Island, in the Ketchikan district, where one of the old gold mines whose ore carries large amounts of pyrites was purchased by the Alaska Paper Mills to supply sulphur required in the manufacture of paper pulp.

Arizona

The Value of Minerals Decreased in Spite of Increased Production, Which Failed to Offset Decrease in Metal Prices.

THE value of the gold, silver, copper, lead, and zinc produced by mines in Arizona in 1926 was $111,106,000, a decrease from $113,138,198 in 1925, according to estimates made by V. C. Heikes, of the Bureau of Mines. There were increases in gold, silver, copper, and zinc, but these increases were not sufficient to balance the decrease in lead and the general decrease in metal prices. The increase in the gold output was especially noteworthy and came largely from the Katherine mine west of Kingman and the New Cornelia mine at Ajo. Arizona retained its place as the leading copper producer of the United States and was first in the combined value of the five metals.

Dividends amounting to $16,728,139 were reported paid in 1926 by the following Arizona mining companies: Calumet & Arizona, United Verde Extension, New Cornelia, Inspiration, United Verde, Magma, Miami, Ray Consolidated (from operations in Arizona and New Mexico), Arizona Commercial, Tom Reed, and Iron Cap. It was further reported that $2,500,000 in dividends was paid by the Phelps-Dodge Corporation, which operates the Copper Queen and Morenci properties in Arizona and other mines in Mexico and New Mexico.

The gold output increased from $4,170,355 in 1925 to $4,982,000 in 1926 as a result of a large increase in the production of gold ore from Union Pass in Mohave County, copper ore in Pima and Yavapai Counties, and copper ore and lead ore from Bisbee in Cochise County. As the Gold Road mine was idle in 1926, the Tom Reed property was the main producer of the San Francisco district, the gold output of which decreased from $502,019 in 1925, to about $381,200 in 1926. Marked increases in gold from copper ore were made by the New Cornelia, Shattuck-Denn, Copper Queen, United Verde and Blue Bell mines. The largest gold producers in Arizona were the United Verde, Copper Queen, Calumet & Arizona, New Cornelia, Tom Reed, Katherine, Shattuck-Denn, Magma, United Verde Extension, and Old Dominion mines.

The silver output increased from 7,257,868 ounces in 1925, to about 7,479,000 ounces in 1926, but the value decreased from $5,036,961 to $4,667,000, as the average price of silver decreased. In recent years the output of silver from Arizona mines has gradually increased and in 1926 it exceeded that of both Idaho and Nevada. The United Verde mine was by far the largest silver producer in Arizona, but other large producers were the Calumet & Arizona, Magma, Copper Queen, United Verde Extension, Shattuck-Denn, New Cornelia, and Bunker Hill mines.

The copper output increased slightly from 713,355,129 pounds in 1925, to about 715,000,000 pounds in 1926, but the value decreased from $101,296,428 to $98,670,000, as the average price of copper decreased. The increase was due in large part to the milling and leaching operations of the New Cornelia Copper Co., at Ajo. Increases were also made by the Morenci mines of the Phelps Dodge Corporation, Shattuck-Denn, Miami, United Verde Extension, Inspiration, Calumet & Arizona, Night Hawk and Blue Bell mines, and the Gila Copper Sulphide Co. was again a regular shipper of copper ore after being idle several years. Eight copper smelting plants within the state were active throughout the year, the plant at Humboldt was blown in February 20, and considerable ore was also treated at El Paso, Tex. Two events of unusual interest to the industry were the completion of the 7,500-ton copper leaching plant for the Inspiration Copper Co., and the construction work on a large flotation plant for the United Verde Copper Co. The largest copper producers in 1926 were the United Verde, Copper Queen, Inspiration, New Cornelia, Ray Consolidated, Morenci, Miami, United Verde Extension, Calumet & Arizona, Magma, and Old Dominion mines. Other mines that produced more than 1,000,000 pounds of copper each were the Arizona Commercial, Iron Cap, Shattuck-Denn, Night Hawk, Blue Bell, Gila Copper Sulphide and El Tiro.

The lead production in Arizona de-

creased from 23,876,017 pounds in 1925, to about 22,920,000 pounds in 1926, and the value from $2,077,213 to about $1,902,000. The Shattuck-Denn mine at Bisbee was the largest lead producer in Arizona making a decidedly increased output; the Copper Queen mine was second, but the output decreased. The Calumet & Arizona property was a large producer of lead from zinc-lead ore shipped to Kansas for smelting. Other important lead producers were the Bunker Hill mine at Tombstone, including flotation concentrate from the Grand Central lease, the Hilltop mine in Cochise County, the El Tiro mine in Pima County, the Sheldon property in Yavapai County, and the Aravaipa Metals Co., in Graham County. The Signal mine in Mohave County, which was a large lead producer in the past, was idle.

The output of zinc recovered from Cochise, Yavapai and Mohave Counties increased from 7,332,116 pounds in 1925, to 12,045,000 pounds in 1926, and the value from $557,241 to about $885,000. Regular shipments of zinc-lead ore were maintained by the Calumet & Arizona Mining Co., at Bisbee, the largest producer, and by the Arizona Hillside Mining Co., in Yavapai County, which again became a large shipper of zinc ore after several years of idleness. Considerable zinc-lead milling ore from the Arizona Premier mine in Mohave County was shipped to a custom plant in Utah. Several hundred tons of zinc ore was marketed from the Mystery mine at Gleeson, in Cochise County, and a large quantity of lead-zinc ore from the Aravaipa property in Graham County was shipped to an eastern plant.

California

California Shows a Decrease of 18 Percent as Compared With values of 1925—Only Metals Showing Increase Are Lead and Zinc.

THE value of gold, silver, copper, lead, and zinc produced at mines in California in 1926, according to the estimate of J. M. Hill of the Bureau of Mines, was $19,078,000, a decrease of $4,206,354 or 18 percent as compared with the value of metals produced in 1925. There were decreased yields of 11 percent in gold, 44 percent in the value of silver, and 34 percent in the value of copper, but increases of 13 percent in the value of lead and 38 percent in the value of zinc produced as compared with the previous year.

The production of gold in 1926 was 565,000 ounces, valued at $11,680,000, a decrease of $1,385,330 as compared with 1925. The output of both placer and deep mines was less than in 1925, though the dredge output was nearly as large as that of the previous year. The dry year interfered with hydraulic work in all sections, but so far as has been learned did not restrict quartz milling. Serious forest fires destroyed several quartz mills in Tuolumne County.

Kennedy Mine and Milling Company, Jackson, Calif.

The silver produced in 1926 was 1,911,000 ounces, valued at $1,192,000, as compared with 3,054,416 ounces valued at $2,119,765 in 1925. The California Rand Silver was not productive after the first of October, which accounts for part of the decrease, but the large decrease in copper ore mined also affected the silver yield adversely and the lead ores shipped in 1926 were not so rich in silver as those produced in 1925.

The production of copper in 1926 was 31,590,000 pounds, valued at $4,360,000, as compared with 46,864,913 pounds valued at $6,654,818 in 1925. There was a much smaller yield of copper from Shasta County mines as compared with the previous year as a consequence of the withdrawal of the United States Smelting, Refining & Mining Co.'s operations in that field. Neither the Engels nor the Walker in Plumas County was as productive as in 1925. The Calaveras Copper Co. and the Island Copper Co. each increased its output.

The lead mines of southern California increased their output of lead by 1,183,800 pounds to a total of 7,750,000 pounds, valued at $643,000, in 1926. The Ophir was the largest producer of lead ores, followed by the Tecopa and Darwin, besides a number of other mines in Inyo County, which shipped lead ore.

Zinc produced by California mines in 1926 amounted to 16,370,000 pounds, valued at $1,203,000, an increase of 4,880,763 pounds and $329,818 in value as compared with the previous year. The largest producers were the California Zinc Co. in Shasta County and the Santa Catalina Island Co. in Los Angeles County, both of whom increased their output. These companies export zinc sulphide concentrates for smelting. There were several producers of oxidized zinc ores in Inyo County, whose ores were smelted in the United States. The California Zinc Co. at Winthrop, Shasta County, was a large shipper of zinc concentrates recovered from ores mined at the Rising Star and Afterthought mines. The Mountain Copper Co. at Matheson shipped some copper ore, and the Mason Valley Mines Co. began production from the Balaklala mine at Kennett.

In Butte County development continued at several of the drift mines near Paradise and Magalia, and the quartz mines near Feather Falls and Yankee Hill were productive. One dredge was in operation near Oroville. The Yuba Consolidated Gold Fields worked six dredges near Hammonton, Yuba County, and the Kumle and Kassabaum dredge near Camptonville was in continuous operation. In Plumas County the Engels and Walker mines made a large production, ore from several gold quartz mines near Spring Garden was milled, and development was under way at properties near Crescent Mills, Greenville, and Seneca. Placer bullion was produced at a number of places on Feather River and near La Porte.

Sierra County mines were fairly active, the Sixteen to One at Alleghany being the largest producer. At Grass Valley, Nevada County, the Empire, Idaho Maryland, and North Star were the largest producers.

In Amador County the Plymouth began milling ore in September. The mines at Drytown and Amador City were idle. Near Sutter Creek the Central Eureka had a very successful year and began unwatering the old Eureka shaft. Unwatering of the North Star shaft began. Near Jackson the Kennedy installed electric power to operate its hoist and made a good production. The

City of Central, Colo.—Oldest Mining Camp in Colorado

Argonaut produced regularly, and the Moore mine resumed milling ore in May. The Sierra Metals Corporation operated the Sunset mine and built a 5-stamp mill. The Pioneer mine, five miles east of Volcano, was producing, but few of the hydraulic mines were worked to any extent, and none of the mills in the Defender district were working. Near Westpoint, Calavaras County, five mines were working and the Caloro Mining Co. built a 25-ton cyanide plant at the Wickham mine. Near Sheepranch the Washington and Enchantress were producing and near Murphy the Treasure, Shaw, and Oro Plata carried on development. At the Rindge mines at Glencoe and Jesus Maria development shafts were sunk. Near Mokelumne Hill the Bright Star and Boston quartz mines were working and the Boundary Cone and Union drift mines were being reopened. None of the quartz mines on the Mother Lode from Mokelumne Hill to Angels Camp were productive; at Fourth Crossing the Thorpe and Demarest mines were under development and some work was being done at the Wagon Rut mine near Altaville. The Victor and Jack Rabbit drift mines near Altaville were working, as was the Calmo drift mine near Angels and the Vallicita Western near Vallicita. Almost no work was done on the quartz mines at Carson Hill, but at Melones the Carson Hill Consolidated was producing and some good ore was reported opened in the Morgan ground. The Gold Knoll mine at Felix was worked, its mill was rebuilt, and a little ore was milled from the Royal. The flotation department of the Calaveras Copper Co.'s mill at Copperopolis was enlarged and a body of high-grade copper ore was opened in the lower levels at the south end of the mine. In Tuolumne County the Experimental mine at Columbia, the Shawmut and Clio mines, south of Chinese Camp, and the Mark Twain mine near Tuttletown were the largest producers of bullion. The Original mine at Clearinghouse, Mariposa County, was a steady producer, and as usual a number of small mines were working near Briceburg, Hornitos, and Mariposa. The Princeton mine at Mount Bullion was further opened, but little milling was done. Lessees worked at several points on the Mariposa Grant.

In western Kern County the Zenda mine near Loraine was worked; the Yellow Dog and Karma Ajax in the Mojave district, and the Tropico near Rosamond were the principal producers. At Randsburg the largest gold producers were the Yellow Aster and King Solomon; several other mines, notably the Black Hawk and Windy, were worked. The California Rand Silver was a regular producer until September, when the mill was shut down pending development on the lower levels. There was considerable activity in Inyo County and a large tonnage of lead ore and some zinc ore was shipped from a number of properties in the Panamint, Slate Range, and Whit mountains. The largest shippers were the Big Horn, Cerro Gordo, Darwin, Estelle, Ophir, Santa Rosa, Slate Range, and Tecopa mines. In San Bernardino County the Von Trigger mine, near Goffs, was producing and a large tonnage of gold-copper ore was shipped from Ludlow by the Pacific Metals, Inc. The mines near Cima, Daggett, and Victorville were worked to some extent. The Mecca Mines Co. in Riverside County shipped lead ore and development was going on near Perris. In San Diego County the chief production was from the Golden Chariot mine in the Julian district. In the same region the North Hubbard and Oriflamme mines were worked. The Blue Light mine near Anaheim, Orange County, was further developed by new interests. On Catalina Island the Black Jack zinc-lead mine was a regular producer and several new ore bodies near Avalon were opened.

Colorado

Silver, Copper, Lead and Zinc Production Increased, But Gold Production Decreased.

THE output of gold, silver, copper, lead, and zinc from Colorado mines in 1926 in terms of recovered and estimated recoverable metal was $6,911,000 in gold, 4,625,000 ounces of silver, 3,350,000 pounds of copper, 66,000,000 pounds of lead, and 65,000 pounds of zinc, according to Chas. W. Henderson, of the United States Bureau of Mines. These figures are to be compared with $7,227,022 in gold, 4,506,940 ounces of silver, 2,360,500 pounds of copper, 62,966,000 pounds of lead, and 61,621,000 pounds of zinc in 1925, and $8,593,116 in gold, 3,254,370 ounces of silver, 2,713,219 pounds of copper, 47,557,061 pounds of lead, and 56,727,000 pounds of zinc in 1924. Compared with the 1925 figures, gold shows a decrease of $316,022, silver an increase of 118,060 ounces, copper an increase of 989,500 pounds, lead an increase of 3,034,000 pounds, and zinc an increase of 3,379,000 pounds. At estimated average prices for metals in 1926, the value of the output of these metals was silver, $2,886,000; copper, $462,000; lead, $5,478,000, and zinc, $4,778,000. These values added to that for gold gives a gross value of output for 1926 of $20,515,000, as compared with $20,851,267 in 1925, and with $18,620,796 for 1924.

The Cripple Creek district in 1926 produced $4,412,000 in gold as compared with $4,608,604 in 1925. The decrease of about $200,000 can be credited to the idleness for two months of the Cresson mine, which in the third quarter of the year produced only 9,000 tons of $15 to the ton as compared with an average of 9,000 tons each month of $13 and upward to the ton during the rest of the year. During July, August and September, the Cresson shaft was being retimbered. This two-compartment shaft and single drum hoist can handle 10,000 to 12,000 tons a month. The Portland Gold Mining Co. made an increased production of what is called its higher grade ores and in addition its 1,200-ton cyanide-concentration mill at Victor was operated at more nearly full capacity on the lower grade ore from stope filling, reject from the picking belts, and dump material. Production was also steady at the various properties of the United Gold mines. The Stratton Leasing Co. drove about 3,000 feet of cross cuts and drifts on the 2,100-foot level of the Findley mine, adjoining the American Eagles, and shipped ore until December 1. Other producing mines were the Ajax, Elkton, El Paso, Empire Lee, Forest Queen, Gold Sovereign, Last Dollar, Midget, Queen and Rose Nicol. Three cars of ore were shipped from a

new strike on the north slope of Mineral Hill, from the Plutocrat claim.

At Canon City the Empire Zinc Co.'s magnetic separation and flotation mill was operated steadily on zinc and zinc-lead ore from stock on hand from the company's Eagle mines at Gilman, supplemented only when necessary by fresh shipment from this mine and occasional cars of zinc-lead ore from the "Leadville Deep" mines. The Empire Zinc Co.'s zinc oxide plant, also at Canon City, was operated steadily on zinc concentrates, zinc sulphide ore, and zinc carbonate ore from the company's mine at Hanover, N. Mex., and zinc carbonate from Leadville. This company's output of zinc concentrate and zinc oxide was approximately the same as in 1925 and had the mill been run entirely on current shipments from its mines, or had stocks been replenished from the mine at the same rate as milling was done, Colorado mines in 1926 would have been credited with a 20 percent increase in production. Figures for recoverable zinc received at smelters from Colorado sources do show an increase for 1926 of 20 percent. The River Smelting & Refining Co.'s fuming and matting plant, at Florence, was operated for 10 months on complex ores and concentrates from Leadville, Garfield, Bonanza, Cotopaxi and Aspen, Colo., and from Bauer, Utah. At Ilse, Custer County, the 150-ton jigs and table-concentration mill at the Terrible mine, ran at somewhat less than the average for 1925 on the cerussite ores of this mine. At Westcliffe, a new shaft was sunk on the Passiflora mine to 300 feet.

From January to July remodeling of the mill was done at the Rawley mine, at Bonanza, and from August on, lead-copper-silver concentrates were shipped to Leadville. The Cocomongo-Bonanza mill at Bonanza was operated part of the year and development work was continued.

At Garfield the Rogers Lead Co. reopened in July the Great Monarch and Marshall tunnels and soon after began shipping zinc-lead ore left there many years ago. Later in the year lead carbonate ores were also shipped from this mine. The Madonna mine, at Monarch, was reopened in 1926.

At Whitepine, Gunnison County, zinc-lead ore continued to be shipped from the Akron Mine Co.'s group and the Morning Star mine was reopened. Small shipments of ore were made from Pitkin.

At Aspen, Pitkin County, zinc-lead ore was shipped from the Woody Creek district, but in the Down-Town district of Aspen, the various properties held under lease and option and operated during 1925, reverted about April 1, 1926, to the original owners and the operations for the rest of the year were confined to small groups of local lessees. Mining and shipping continued from the Park, Hope, and Newman Tunnel groups. At Rifle, Garfield County, the 25-ton vanadium plant was operated steadily and two new units were added, bringing by December 1 the capacity up to 110 tons a day.

At Gilman development work continued at the replacement ore bodies of the Eagle mine of the Empire Zinc Co., and zinc ore was shipped only as needed by that company's mill at Canon City. Some silver-iron sulphide ore was also shipped from this mine to Salt Lake smelters.

At Leadville development and reopening of the Carbonate Hill-Graham Park mines resulted in the mining and shipment of 60,000 tons of zinc-lead-iron sulphide ore, and in addition silver-iron sulphide and zinc carbonate ores. These mines were reopened for mining about July, 1925, after an idleness for part of the area from October, 1918, and for part from April, 1919. Between September, 1923, and July, 1925, over six billion gallons of accumulated water were pumped from the workings of this group. The unwatering pumps were installed at both the Greenback and Pyrenees shafts. The program for this consolidated group has only begun. While mining is being continued in those properties now accessible, cross cutting will connect the Pyrenees shaft with the Mikado-Marian-R. A. M. properties, where much proved ore was left at the time of closing in April, 1919. The production of this group in 1926 was over two times that made in 1925. Some 45 mines in all were operated at Leadville in 1926. Some work was done at the Dolly B., Fortune, and Resurrection, reached through the Yak adit. Lessees on the Ibex and Golden Eagle mines continued to ship some specimen gold and siliceous gold ores. Zinc-lead sulphide and zinc carbonate ores were also shipped from the Ibex. The Western zinc oxide plant, operated entirely on local low-grade zinc carbonate ores, was idle for 3½ months in the spring and early summer because of shortage of ore of this character. This plant purchases zinc carbonate ore carrying as low as 14 percent zinc. Most of the zinc carbonate ore came from Carbonate and Fryer Hills. The Colorado Zinc Lead Co.'s 150-ton selective flotation mill was ready for full capacity operation July, 1926, and gave a market for zinc-lead-iron ores, carrying in combined zinc and lead several points less than that demanded by the lead-zinc oxide plants of the Middle West and the East. The Arkansas Valley lead bullion and lead-copper matte smelter was operated continuously, part of the year with four furnaces but with only two furnaces at the end of the year. One car of ore was shipped from the Canterbury drainage adit and driving was continued slowly. During the year this adit cut another fault, again bringing the Cambrian transition shales and white limestone beds above the adit level.

At Climax or Fremont Pass the Climax Molybdenum Co.'s mill capacity was gradually increased from 10,000 tons a month in January, 1926, to 22,000 tons in December. At Kokomo, where reopening of caved cross-cut adits and mine workings was begun in November, 1925, development by August, 1926, had opened up much pyrite, pyrrhotite, and some low-grade zinc-lead-iron sulphide, but not sufficient to warrant building a mill.

At Montezuma, Summit County, several hundred tons of zinc-lead sulphide ore was shipped to Utah flotation plants from the Bell mine, idle for 20 years when reopened in 1925. The Saints John mine was also reopened and a 50-ton flotation mill built on the property.

At Breckenridge some hydraulicking and sluicing of placer deposits were done, but the Tonopah dredge was idle all year. The Blue River dredge, the superstructure of which was burned to the deck in June, 1925, was rebuilt during the summer of 1926 and operated for a month, when, unfortunately, it sank in the dredge pond but was soon floated again. The Wellington zinc-lead mine was operated steadily, as were the two Wellington mills, one a jig and table-concentration mill and the other a roast-magnetic-separation mill, with a resultant increased production of zinc and lead concentrates. Lead carbonate ores were shipped from the Detroit and Wellington.

At Alma some lead-silver ore was shipped from the Russia mine, on Mt. Lincoln, and gold-silver-copper-lead-zinc ore was shipped from the Home Sweet Home. The Mineral Basin, or Weber group, was the scene of some development work, the building of cabins and a 25 - ton concentration - flotation mill. Lessees continued work at the London mine until March. The Fairplay dredge remained idle and the bucket line was shipped away.

At Silver Plume, Clear Creek County, the East Butte flotation mill was operated part of the year on ore from the Dives-Pelican-Zero group. The Watrous flotation mill and the Wasatch jigs and table concentration mill were operated part of the year. Some development work was done at the Stephens mine above Silver Plume and at the Capitol, near Georgetown. The Nelson Leasing Co. operated its 10-ton mill at Empire. Some development and mining was done at Lawson and Dumont and at Freeland. At Idaho Springs, on Chicago Creek, just above the Jackson diggings of 1859, a surface discovery of free gold and sylvanite, was opened for 100 feet in length, 90 feet in depth, and from varying widths of mineralized schist, after picking and screening, 180 cars of gold ore were shipped directly to the Golden Cycle mill

Portland Gold Mining Company, Victor, Colo.

at Colorado Springs. An adit is being driven to cut this fissure about 50 feet lower. The sampling works at Idaho Springs handled 25 percent more ore in 1926 than in 1925 from Clear Creek and Gilpin counties. Several mines were reopened at Russell Gulch and shipments of smelting and milling ore were made. The Newhouse adit, idle for five years, was cleaned out and put in working order, so that a drift and raises could be made from the adit level on the Kansas-Burroughs group, or Quartz Hill. One of the original objects of the Newhouse adit was to drain Quartz Hill, Gilpin County, but the ground was found to be too tight and no drainage has ever been brought about, although diamond drill holes have been tried, without success. The Rose City 50-ton selective flotation mill (formerly the Iron City mill), at Black Hawk, was operated the greater part of the year on galena-sphalerite ores of Gilpin County. The Gilpin Eureka stamp-amalgamation mill was operated on ores from the Eureka mine.

In Boulder County the Fairview Mining Co. operated its flotation mill at Cardinal on ores from the Boulder County mine, and lessees shipped silver ore from the Caribou mine, at Caribou. There was a renewal of mining for tungsten at Nederland and Tungsten, and production was made from the Tungsten Products Co. mine (formerly the Vasco) and from the Wolftongue mill. Otherwise mining was very inactive in Boulder County and the sampling works was nearly forced to close.

In the San Juan region, at Lake City, there were several shipments of zinc-lead and lead-copper silver ore, but much building, construction, and development work was done.

Silver ore shipped from Creede carried 537,000 ounces of silver as compared with 738,000 ounces in 1925. At Summitville, Rio Grande County, from the Little Annie mine, a large producer in the seventies, several lots of specimen gold and one car of smelting ore brought returns of about $100,000 in gold. In San Juan County, the Sunnyside selective flotation mill treated 750 tons daily and made an increased production of lead and zinc concentrates. The ore of this mine averages 0.07 ounce gold, 3.7 ounces silver, 4 percent lead, 0.4 percent copper, 4.5 percent zinc, and 10 percent iron. In order to keep as much gold as possible out of the zinc concentrate, a zinc-lead middling was made, which was sent to Reed-Coolbaugh sulphating plant at Durango, where the zinc was recovered as zinc sulphate, and the residue went direct to the lead furnace of the Durango smelter. Several other mines were operated in the vicinity of Silverton, and much development work was done at the Shenandoah, Mayflower, North Star group. In the Red Mountain district, on the county line between San Juan and Ouray County, copper ore and zinc-lead ore was shipped from the San Antonio. Lessees made their annual summer mill run at the Barstow and zinc-lead ore was shipped from the Imogene. At Ouray much development work was done in the sedimentary formations adjacent to the town and lead-silver ore was shipped from the Bachelor, Pony Express, and Mineral Farm. Very little work was done in the Sneffels district, Ouray County, but in the upper San Miguel district, just over the county line in San Miguel County, the Smuggler Union mine made an increased production. At the Tomboy mine there was a continuation of the pulling of old stopes, which have been milled for several years at a profit, but in November the general manager reported that the mine would most probably close at the end of the year. Zinc-lead ore was shipped from the Black Bear to selective flotation custom plants in Utah. At Ophir producing mines were the Carbonero and San Bernardo. At Rico development begun in 1925 continued throughout the year with shipments of zinc-lead ore to Utah and lead-silver ore to Durango. On November 1 the newly built 150 to 200-ton selective flotation mill of the International Smelting Co. was set in operation, zinc concentrates going to Bartlesville, Okla., and lead concentrates to Durango. Some ore had been held at Rico preparatory to the starting of this mill. Producing companies and mines in this district were the Falcon Lead Co., Rico Mining & Reduction Co., Rico Argentine Co., International Smelting Co., and Union Carbonate mine. The mines of La Plata County produced only a few cars of gold-silver ore, but there was some development work and much remodeling and repairing of camp buildings and mills in the county.

Idaho

Large Increase in Lead and Zinc Production Due to Improved Milling Practice More Than Offset Decrease in Other Metals.

THE value of the gold, silver, copper, lead, and zinc produced from ore mined in Idaho in 1926, according to estimates by C. N. Gerry, of the Bureau of Mines, was about $30,781,000, as compared with $30,662,621 in 1925. There was a large increase in lead and zinc, but a decrease in gold, silver, and copper. The increase, however, in the value of the zinc output more than offset the decrease in the value of gold, silver, and copper produced as well as the general decrease in metal prices. Improvement in milling practice has been an important factor in the production of lead and zinc, especially at the Morning and Hecla mines and various properties in the Pine Creek region. The increase from the Star, Livingston, United Idaho, Highland Surprise, Sidney, and Constitution mines was notable. The copper output was unusually low, as shipments of copper ore from Lemhi, Custer, and Shoshone Counties were decidedly curtailed. The gold production was far below normal, as both the large dredges at Murray and Featherville were idle half the year.

Mining companies reported paying dividends amounting to approximately $7,330,901. These were paid principally by the Bunker Hill, Federal, Hecla, and Sidney companies.

The mine output of gold was valued at $254,000, as compared with $431,771 in 1925, a marked decrease of about 40 percent, due to the closing of the dredge at Murray and the idleness of the Featherville plant during half the year. A

decided decrease was also recorded by the Idaho Metals Co., at Mackay, the Gold Hill & Iowa mine at Quartzburg, and the Unity mine at Warren. The small dredge in Boise County was the only important new gold producer. The largest producers of gold were the South Park dredge, Yukon dredge, Gold Dredging & Power Corporation, Idawa, Golden Age, and Boise placer mines.

The output of silver decreased from 7,743,439 ounces in 1925 to about 7,262,000 ounces in 1926, and the value from $5,373,947 to $4,531,000. There was an increase in silver produced from lead-zinc ores, especially from the Star and Constitution mines, but this was not sufficient to compensate for decreases from other large producers of silver. In the Coeur d'Alene district, which produced 6,600,000 ounces of silver, about 70 percent of the product was recovered from the ores of the three largest producers —the Hecla, Morning, and Bunker Hill mines. The Crescent, Gold Hunter, and Tamarack & Custer were also large producers, and the Sunshine, Star, United Idaho, and Constitution followed. Notable decreases were those of the Talache property in Bonner County and the Ramshorn mine in Custer County, and the Hercules mine, an important producer in the past, was worked out early in 1925.

The output of copper decreased from 3,297,443 pounds in 1925 to 839,000 pounds in 1926, and the value from $468,237 to $116,000. The Idaho Metals Co., at Mackay, was active only part of the year on company account, and the Harmony Mining Co., in Lemhi County, did only development work, though preparations for milling were made in December. In Shoshone County a new flotation mill was completed and operated late in the year by the Oregon-Idaho Mining & Concentrating Co., treating ore from the Snow Storm mine at Larsen.

The output of lead increased from 253,041,790 pounds in 1925 to 265,310,000 pounds in 1926. The value, however, was $22,021,000, or about the same as that of 1925, as the average price of lead decreased. The Bunker Hill, Morning, and Hecla mines were as usual the three largest producers, but most of the increase came from mines in Pine Creek and from the Star property. In the southern part of the state increased output was recovered from the United Idaho, Livingston, Wilbert, and Kay mines. The production of the Latest Out mine at Gilmore was unusually small. Greatly increased recovery of lead from lead-zinc ores was brought about by change of the Morning mill to an all-flotation plant, rebuilding of the Sweeney mill as a custom flotation plant, and improvement of the Star and Hecla mills and various plants in Pine Creek. The three leading producers of lead were followed by Tamarack & Custer, Star, Gold Hunter, United Idaho, Idaho Continental, Livingston, Constitution, Frisco, Stratton, Highland Surprise, Hypotheek, Sidney, Hummingbird, and Jack Waite mines. At the Galena mine, west of Wallace, milling began in December.

The zinc recovered from ore and concentrate increased from 31,237,240 pounds in 1925 to 52,500,000 pounds in 1926, and the value from $2,374,030 to $3,859,000. Most of the output was recovered by leaching at Great Falls, Mont., and nearly all the remainder was shipped to Belgium for smelting. About 4,900 tons of high-grade zinc concentrate was shipped a month from the Coeur d'Alene region. The largest producers of zinc were the Morning, Star, Constitution, Highland Surprise, Sidney, Success, Tamarack & Custer, and Douglas mines. Litigation prevented shipments from the Nabob mine, but the new flotation mill at the Page (Corrigan) mill west of Kellogg started milling zinc ore in December.

Montana

Value of Mineral Production Considerably Below 1925—Lead and Zinc Production Increased.

THE value of the gold, silver, copper, lead, and zinc produced from Montana mines in 1926, according to estimates made by C. N. Gerry, of the Bureau of Mines, was $57,988,000, a decrease from $61,044,006 in 1925. The mines at Butte were operated steadily, but the production of copper, gold, and silver was less than in 1925. The increase in zinc and lead produced was not sufficient to offset the decrease in output of other metals and in metal prices.

The Anaconda Copper Mining Co. and the Butte & Superior Mining Co., according to published statements, paid dividends amounting to $9,580,000 in 1926.

The value of the gold output decreased from $1,697,630 in 1925 to $1,185,000 in 1926. The largest gold producers in the state were the Anaconda, Jardine, St. Louis, New Gould, Poser, and Sterling properties.

The mine output of silver decreased slightly from 13,158,191 ounces in 1925 to 12,570,000 ounces in 1926, but the value decreased relatively more, from $9,131,784 to about $7,844,000, as the average price of silver decreased. Most of the silver was produced from copper ore as in the past, but an increasing quantity resulted from the milling of zinc ore and lead-zinc ore at Butte and Anaconda. The mines of the Anaconda Copper Mining Co. and the Butte & Superior Mining Co. produced about three-fourths of the state's silver. Next in order came the Silver Dyke mine at Neihart, and the Elm Orlu, Poser, Anselmo, and East Butte mines at Butte.

The copper output decreased from 268,910,847 pounds in 1925 to 256,725,000 pounds in 1926, and the value from $38,185,340 to about $35,428,000. The Anaconda Copper Mining Co. produced most of the copper from mines at Butte. Every effort was made to reduce the cost of production, especially as the price of copper during the year was low. Miners were required to select ore above a certain grade for milling as well as smelting. No smelting was done at Butte and the milling of copper ore was done largely at Anaconda. Other large copper producers were the Butte & Superior, Anselmo, East Butte, North Butte, and Elm Orlu mines at Butte. The Silver Dyke mine at Neihart increased its copper output as well as silver and lead.

The production of lead increased from 37,530,644 pounds, valued at $3,265,166 in 1925, to 41,700,000 pounds, valued at $3,461,000 in 1926. Improvements in the treatment of lead-zinc ore have increased shipments to reduction plants at Anaconda and Butte. This custom-milling is showing a marked effect not only on the output of Butte mines but on mines in Cascade, Granite, and Jefferson Counties. The Angelica mine has thus become a large producer of both lead and zinc. Other companies, such as the Silver Dyke, Block P., and Jefferson Milling Co., produced much lead through the operation of their own mills. Companies in Montana producing more than one million pounds of lead each were the Butte Copper & Zinc, Butte & Superior, Anaconda, Silver Dyke, Elm Orlu, Poser, Block P., Moulton, and slag dumps at Melrose and Gibson.

The output of zinc recovered from ore mined in Montana increased from 115,316,922 pounds in 1925 to about 137,000,000 pounds in 1926. The value increased from $8,764,086 to about $10,070,000. About 12,000 tons of zinc concentrate was shipped a month to Great Falls and abroad from ore produced in Montana. The electrolytic zinc plant near Great Falls was crowded beyond capacity with concentrate from Anaconda and Butte, and from custom material shipped from Idaho, Utah, and other states. Zinc concentrate was shipped for export to Belgium from the Snow Storm, Iron Mountain, Big Eight, and Broken Hills mines, but only one car was shipped to an eastern smelter. The large zinc producers at Butte were the Butte & Superior, Butte Copper & Zinc, Elm Orlu, Poser, Anaconda, Moulton, North Butte, and Anselmo mines.

Good increases were made at the Poser, Butte & Superior, and Butte Copper & Zinc mines. Considerable zinc ore was milled from other districts, especially from the Angelica, Philipsburg, Silver Manganese, Queen, Crystal, Iron Mountain, Snow Storm, Comet, Big Eight, and Buckeye mines. At Troy in Lincoln County, the Snow Storm mill was operated on a custom basis, most of the mill feed coming from British Columbia.

Manganese Mines, Philipsburg District, Mont.

Nevada

The Increase of Nearly 12 Percent in Value of Metal Output Due to Increased Copper Production.

THE value of the gold, silver, copper, lead, and zinc in Nevada increased from $23,309,352 in 1925 to about $26,084,000 in 1926, according to a preliminary statement prepared by V. C. Heikes, of the Bureau of Mines. The increase of nearly 12 percent in the value of the metal output was due entirely to the increased output of copper, as the other metals decreased in both quantity and value.

The dividends paid by Nevada mining companies in 1926, according to published reports, amounted to about $2,327,054, nearly all of which was paid by the Nevada Consolidated Copper Co., now operating properties in Nevada, Arizona, and New Mexico. Other contributors were the Betty O'Neal and Tonopah Mining companies.

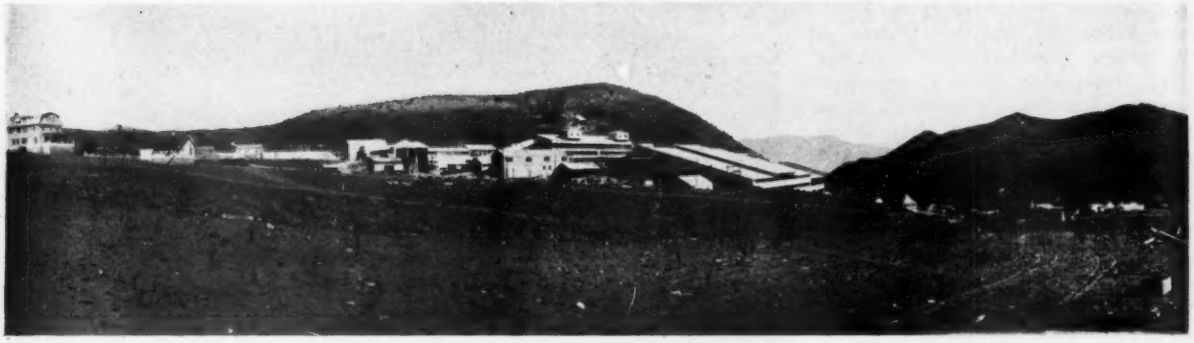
The gold output decreased from $3,867,798 in 1925 to $3,708,000 in 1926, on account of the marked decrease in bullion from the mines at Jarbidge and Tonopah. The Comstock Merger Mining Co. remained the leading producer of gold in the state, but the property was closed in December. The Nevada Consolidated mine at Ely was the second largest producer, as a result of an increase in the smelting of copper ore, and the Elkoro property at Jarbidge was third. Other large gold producers were the Round Mountain, Flowery Mines, Tonopah Belmont, United Eastern (Jarbidge), Tonopah Mining, Tonopah Extension, Richmond Eureka, and West End mines. The gold output from Storey County (Comstock district) decreased from $1,196,946 to $1,137,000, and gold from Tonopah decreased from $683,623 to about $443,000. Formerly the mines in the Tonopah district produced more gold than those in any other district in the state, but in 1926 the Comstock district was first, the Robinson (Ely) district second, the Jarbidge district third, and the Tonopah district fourth. The Elkoro Mining Co. at Jarbidge reported a decidedly decreased output of gold, but a new ore-body was said to have been opened late in the year.

The silver production decreased from 7,096,618 ounces in 1925 to about 6,462,000 ounces in 1926, and the value from $4,925,053 to $4,032,000. The Tonopah district produced about 2,080,000 ounces of silver, a decrease from 3,070,409 ounces in 1925, due largely to curtailment at the Tonopah Extension property. The Comstock Merger mine at Gold Hill was the largest silver producer of the state, followed by the Betty O'Neal and Tonopah Belmont properties. The mines of the Comstock district increased their output from 1,350,156 ounces to about 1,478,000 ounces. Other large silver producers were the Tonopah Mining, Tonopah Extension, Tonopah Divide, West End, Consolidated Cortez, and Combined Metals mines. The large decrease from Tonopah was in part balanced by increases from the Betty O'Neal, Comstock Merger, Bristol Silver, Tonopah Divide, and Lucky Boy property at Hawthorne, Mineral County.

The copper output increased from 79,300,224 pounds in 1925 to about 113,616,000 pounds in 1926, and the value from $11,260,632 to about $15,679,000. The Nevada Consolidated Copper Co., operating property at Ely, was by far the largest producer of copper in the state. During the first quarter of the year the output averaged about 6,500,000 pounds of net copper a month, and this record was greatly increased later in the year, though no separate figures on production have been published since the consolidation of the company with the Ray Consolidated Copper Co. of Arizona. The Consolidated Copper Mines Co. produced several million pounds of copper after making a contract in June with the Nevada Consolidated Copper Co. for milling and smelting its ore. An event of interest to copper producers was the starting of the Mason Valley smelter at Thompson in August after being idle seven years. The plant received custom ore from Nevada and California, but most of the copper recovered came from the Bluestone and Mason Valley mines near Mason, where the Mason Valley Mines Co. operated a large flotation plant.

The lead output decreased slightly from 24,476,452 pounds in 1925 to about 23,700,000 pounds in 1926, and the value from $2,129,451 to about $1,967,000. The Combined Metals mine at Pioche was again the largest producer of lead, but it was followed closely by the Eureka Holly mine at Eureka. Other large lead producers were the Richmond Eureka, Simon Silver-Lead, Bristol Silver, Spruce Monarch, Black Forest, and Prince Consolidated mines. The Yellow Pine Mining Co. at Goodsprings, the largest producer of lead in 1924, closed its property in September, and the Simon Silver-Lead Mines Co. started its mill the same month, after being idle nearly two years. A new source of lead was the Tonopah Belmont Co.'s mine at Hamilton, White Pine County, where a flotation plant was completed and operated.

The zinc recovered from ore mined decreased from 14,821,293 pounds in 1925 to about 9,500,000 pounds in 1926, and from $1,126,418 in value to about $698,000. The decrease is accounted for by the closing of the Yellow Pine mine which for many years was the largest zinc producer in the state. The Combined Metals Co. at Pioche was by far the largest zinc producer in Nevada. A sulphide zinc-lead ore is shipped to Bauer, Utah, for treatment by flotation, and the resulting lead concentrate was shipped to International, Utah, and the zinc product to Great Falls, Mont., and eastern plants. Other zinc producers were the Yellow Pine Mining Co., active eight months of the year, and the Simon



Comstock Merger Mines, Inc., Nevada

Silver-Lead Mines Co., which resumed milling in September.

New Mexico

Lead, Copper and Zinc Show Increase in Production With Decrease in Production of Gold and Silver.

THE output of gold, silver, copper, lead and zinc from New Mexico ores in 1926 in terms of recovered and estimated recoverable metal was $419,000 in gold, 482,000 ounces of silver, 7,888,000 pounds of lead, 82,600,000 pounds of copper, and 24,200,000 pounds of zinc, according to Chas. W. Henderson, of the Bureau of Mines. These figures are to be compared with $549,073 in gold, 735,124 ounces of silver, 6,420,000 pounds of lead, 76,427,825 pounds of copper, and 18,492,300 pounds of zinc in 1925. These figures show decreases for gold and silver, but increases for lead, copper and zinc. At estimated average prices for 1926, the value of the output was gold, $419,000; silver, $300,800; lead, $654,700; copper, $11,398,800, and zinc, $1,778,700. These values give a gross estimated value of the output of $14,552,000 as compared with $13,875,960 in 1925, an increase of about $676,000, or 5 percent.

The metal of chief value produced in New Mexico is copper. The value of the copper production for 1926 was $11,398,800, as compared with $10,852,751 in 1925. The most prominent mining operation in New Mexico is that of the Chino Mines, with steam shovel pits and some underground workings at Santa Rita and a 12,000-ton flotation mill in seven units, at Hurley. This mine produced in 1926 copper concentrates and copper smelting ore carrying 73,071,000 pounds of copper, as compared with copper concentrates and copper smelting ore in 1925, carrying 70,218,343 pounds. The Lordsburg district also produced much copper from a highly siliceous copper-gold-silver ore shipped for furnace linings in copper smelting operations in Arizona and at El Paso, Tex. The Lordsburg district in 1925 produced 108,219 tons of ore, carrying in terms of recovered metals $222,823 in gold, 126,781 ounces of silver, 69,700 pounds of lead, and 5,064,140 pounds of copper. The Lordsburg district in 1926 produced 104,000 tons of ore of about the same assay content and recoverable content to the ton as in 1925. At the Burro Mountain branch of the Phelps Dodge Co., at Tyrone, special leaching operations were continued but the output was less than in 1925 because the recovery was naturally less in this the sixth year of leaching the same pile. Several thousand tons of copper ore was shipped to El Paso, Tex., by the Hanover-Bessemer Iron & Copper Co., at Fierro, in addition to several hundred thousand tons of iron ore to the steel plant at Pueblo, Colo. Copper carbonate ore continued to be shipped from Pastura, Guadalupe County. Nearly 100,000 tons of iron-manganese ore was shipped from Silver City to the steel plant at Pueblo, Colo.

At Mogollon, 80 miles west of Silver City, all mining ceased in December, 1925, and the production in 1926 was nothing but a clean-up of the mill. In 1925 this district produced $163,322 in gold and 449,699 ounces of silver. In 1926 this loss of gold production was partly made up by an increase from copper ores and the loss of silver production was partly made up by increased production of silver-lead ores. Old dumps, at Lake Valley, Sierra County, continued to contribute silver-bearing ores and there was some production of silver ores from Kingston, Fairview and Chloride. Gold placers and the Aztec lode mine, at the base of Mt. Baldy, Colfax County, contributed gold bullion and gold concentrates.

The large increase in the production of lead in New Mexico in 1925 over 1924 was not only maintained but was greatly augmented in 1926. Lead ores were shipped from Oregon Mountain, Cooks Peak, Hachita, Georgetown, Hanover, Florida Mountains, Gallinas Mountains, Steins and Kelly-Magdalena districts.

The zinc production in New Mexico in 1926 was from Hachita, Hanover, Kelly, Los Cerrillos, and Pinos Altos. The Empire Zinc Co.'s magnetic separation and flotation mill at Hanover made an increased production in 1926 as compared with 1925 and operation of Ozark flotation mill at Kelly was resumed after several years idleness. The zinc concentrate made at Kelly was exported. The Collier Mines Co. operated its 50-ton flotation mill at Los Cerrillos, and the American flotation mill at Hachita was operated part of the year, as were the Calumet, New Mexico, and Jackson mills, at Pinos Altos. In addition the Ozark Smelting & Refining Co., Coffeyville, Kans., bought zinc-lead sulphide and oxide ores from Kelly.

During 1926 a 600-ton selective flotation mill was completed near Glorieta, and a 12-mile tramway was built to the Pecos mine, on Willow Creek. This mill will be started in January, 1927, and barring only a heavy drop in the price of zinc will produce yearly 60,000 tons of zinc concentrate and 24,000 tons of lead concentrate.

Oregon

The Value of Mineral Production Decreased 72 Percent as Compared With 1925 in Spite of the Increase of 131 Percent in Copper and 113 Percent in Lead Production.

THE value of gold, silver, copper and lead produced in Oregon in 1926, according to the estimate of J. M. Hill, of the Bureau of Mines, was $334,300, a decrease of $96,453 or 22 percent as compared with the value of metals produced in 1925. The output of gold decreased 28 percent, largely because of the decrease in dredge yield. The output of copper increased 131 percent and lead 113 percent as compared with the output of those metals in 1925.

In 1926 it is estimated that 13,600 ounces of gold were produced in Oregon, valued at $281,000, as compared with 18,983 ounces, valued at $392,409 in 1925. The Buffalo Monitor, Empire dredge, Cornucopia and Bunker Hill mines were

the largest producers of gold. The dry year seriously interfered with mining in all sections of the state, the output from placer mines fell off considerably, and there was a slight decrease in gold production from deep mines.

The silver production of Oregon in 1926 was 29,400 ounces, valued at $18,300, as compared with 32,793 ounces valued at $22,758 in 1925, a decrease of 10 percent in quantity and 20 percent in values. The largest production of silver was from concentrates shipped from the Granite district, though copper concentrates and gold-silver ore produced in eastern Oregon added materially to the silver yield.

The Homestead Iron Dyke copper mine began shipping late in September after a shut-down of several months. Copper was recovered from mixed concentrates shipped from the Granite district. The total production of copper in Oregon in 1925 was 246,000 pounds, valued at $34,000, as compared with 106,325 pounds valued at $15,098 in 1925.

The lead yield in 1926 was 12,000 pounds, valued at $1,000, as compared with 5,612 pounds valued at $488 in 1925. The lead was a by-product of gold-silver concentrates shipped from eastern Oregon.

In eastern Oregon the largest producers of gold from quartz mines were the Cornucopia, at Cornucopia,, the Buffalo Monitor, at Granite, the Snow Creek and the Ibex, in the Greenhorn district, and the Rainbow, in the Mormon Basin district. The Superior dredge, near Bridgeport, worked half the year, being hampered by low water, and the Empire dredge, near John Day, was idle several weeks during low water in the summer. The Idaho Copper Corporation started production at the Homestead Iron Dyke mine in the early fall. No ore was shipped from the Bay Horse mine. Development at the Baisley-Elkhorn, near Sumpter, was further advanced and it is reported that the mill will start early in 1927. Development was continued on the various copper properties near Keating and at the Miller Mountain mines near Prairie City. The smelter at Sumpter was taken over by the Northwestern Smelting & Refining Co. during the summer, but was not operated during 1926.

In southwestern Oregon there was considerable development work accomplished on various quartz properties near Applegate, Galice, Gold Hill, and Leland, but milling was limited by shortage of water and production from quartz mines, except for the Bunker Hill, was not up to expectations. The dry season likewise was hard on the placer mines and short runs were the rule, though a number of placer mines were in shape to produce.

Chino Branch of the Ray Consolidated Copper Company at Santa Rica, N. Mex.

South Dakota

IN 1926 the Homestake mine, the largest producing gold mine in the United States, produced approximately $5,794,000 in gold and 82,000 ounces of silver, states Chas. W. Henderson, of the Bureau of Mines, in reviewing the metal mining output of South Dakota during 1926. In 1925, the Homestake mine and several small gold mines in South Dakota produced gold valued at $5,989,604 and 96,133 ounces of silver. In 1926, the Homestake Mining Co. also produced tungsten concentrate. Development work was done at small mines near Keystone, S. Dak.

Texas

METAL mines in Texas in 1926 produced 95 ounces of gold and 381,000 ounces of silver and nominal quantities of copper and lead, according to Chas. W. Henderson, Bureau of Mines, Department of Commerce. The greater part of the production came from the Presidio mine, at Shafter, Presidio County, a consistent producer since 1885. In April, 1926, this mine was taken under option to purchase by the American Metal Co., which shut down the cyanidation mill in September, in order to concentrate on underground development work.

Utah

Copper and Zinc Production Greater Than Any Previous Year—Silver and Lead Production Large—Gold Production Increased.

THE mines of Utah in 1926 produced gold, silver, copper, lead, and zinc valued at $81,971,000, a decrease of about $730,000 from the output of 1925, according to estimates by V. C. Heikes, of the Bureau of Mines. Utah made a record in the production of both copper and zinc, the greatly increased output surpassing the production of any past year. The silver and lead, though large, were somewhat less than in 1925, and the gold output was slightly increased. The average prices paid for silver, copper, lead, and zinc decreased slightly, but the increased value of the zinc output was about equal to the decreased value of the silver production. Utah was first in the United States in the production of silver, second in lead, and third in copper. Decided progress was made in custom milling operations at International, Midvale, and Bauer.

The dividends reported paid by mining companies in Utah in 1926 amounted to about $15,167,893, exclusive of $3,030,325 paid by the United States Smelting, Refining & Mining Co., which controls mines at Eureka and Bingham, as well as mines in other states. The companies that contributed to this total were the Utah Copper, Tintic Standard, Silver King Coalition, Park Utah Consolidated, Utah Apex, Chief Consolidated, Plutus, Mammoth, Bingham Mines, Ohio, Keystone, Eagle & Blue Bell, and Horn Silver.

The gold production increased slightly from $3,675,516 in 1925 to about $3,721,000 in 1926. Practically all the gold was recovered from ores smelted. In general the mines of the Bingham district made a good increase in gold, the Park City region produced about the same as in 1925, and the Tintic district showed a slight increase. Pronounced increases in the output of gold were made by the Utah Copper, Utah Delaware, Tintic Standard, and Park Utah Consolidated mines, and from old tailings shipped from the Bullion Beck and Mammoth dumps, but there were large decreases from the Utah Apex, Chief Consolidated, and United States S. R. & M. properties.

The silver output decreased from 21,276,689 ounces in 1925 to 19,186,000 ounces in 1926, but the production was greater than that of the war period and exceeded any year except 1925. The value of the silver output decreased from $14,766,022 to $11,972,000, or about 19 percent, due in part to the decrease in the average price. Silver from the Bingham district was nearly the same in amount as in 1925, but that from the Tintic and Park City districts was less. The Park Utah Consolidated Mines Co. was the largest producer of silver in Utah, but it was followed closely by the Tintic Standard Mining Co. Next in order came the Silver King Coalition Mining Co. and the Chief Consolidated Mining Co., each making a decidedly decreased output. Other large producers were the Plutus, Ontario, Utah Copper, Mammoth, United States S. R. & M., Utah Apex, Bingham Mines (including Victoria), Utah Delaware, Mammoth tailings, Eagle & Blue Bell, and Bullion Beck tailings. Decidedly increased production was made by the Plutus, Mammoth, and Ontario mines. The Ophir Hill Consolidated property at Ophir, a large producer in the past, did development work but shipped no ore.

The production of copper increased from 236,486,540 pounds in 1925 to 255,540,000 pounds in 1926, and the value from $33,581,089 to $35,265,000. Utah retained its place as the third producer of copper in the United States and was close to Montana on account of the large increase from the Utah Copper property at Bingham. The company, which milled nearly 40,000 tons of ore a day and recovered 88 percent of the copper in concentrate, produced 17,875,000 pounds of net copper a month during the first half of the year and later increased its output to more than 20,000,000 pounds a month. The Ohio Copper Co. at Lark was second with a decreased output from mine water precipitates, and the Utah Apex mine at Bingham followed closely. Other large producers were the Utah Delaware at Bingham, Chief Consolidated at Eureka, Park Utah Consolidated at Park City and Keatley, Mammoth tailings and Mammoth mine at Mammoth, Tintic Standard at Dividend, and Silver King Coalition at Park City. The new mill at the Utah Apex mine has been equipped to treat copper-lead ore as well as lead-zinc ore by flotation.

The lead output decreased from 306,669,824 pounds in 1925 to 292,184,000 pounds in 1926, a decrease of nearly .5 percent. The value decreased from $26,680,275 to $24,251,000 and the average price from 8.7 cents to about 8.3 cents a pound. The lead smelting plants at Murray, Midvale, and International were active and the increase in bullion shipments from International was notable. Improvements at the local and custom milling plants have increased the lead recovered from lead-zinc ore, but several companies restricted the output of first-class lead ore. Seven companies each produced more than 20,000,000 pounds of lead—Tintic Standard, Park Utah Consolidated, Utah Apex, Silver King Coalition, United States S. R. & M., Utah Delaware, and Chief Consolidated. The output increased from the Utah Delaware, Tintic Standard, and Park Utah Consolidated properties, but decreased from the Utah Apex, Silver King Coalition, United States S. R. & M., and Chief Consolidated mines. Other large producers were the Bingham Mines, Plutus, Bullion Coalition, Mammoth, Eagle & Blue Bell, Stockton Lead, Horn Silver, Bingham Metals, Cardiff, Bullion Beck tailings, Moscow, Ontario, and Niagara mines.

The zinc recovered from ore and concentrate leached or smelted increased from 52,611,732 pounds in 1925 to about 92,000,000 pounds in 1926, and the value from $3,998,492 to $6,762,000. The custom flotation plant at International was unusually active the entire year, and the new Midvale plant of the United States Co. reached a capacity of 750 tons late in the year. The mill at Bauer treated ore from Utah and Nevada, and new flotation mills making zinc concentrate were operated by the Utah Apex at Bingham, Silver King Coalition at Park City, and Chief Consolidated at Eureka. It was estimated that 11,260 tons of zinc concentrate a month, mostly from Utah, was shipped out of the state from the custom mills and from the mills of the Utah Apex, Chief Consolidated, and Silver King Coalition companies. The United States S. R. & M. property at Bingham retained its place as the largest zinc producer of Utah, and it was followed by the Park Utah Consolidated, Utah Delaware, Chief Consolidated, Utah Apex, and Silver King Coalition companies. Other zinc producers were the Utah Copper, Park Bingham, Utah Metal & Tunnel, Bingham Metals, Niagara, Alaska, Cardiff, Park Galena, Keystone, and tailing operators at Park City.

Utah Mining Company, Bingham Canyon, Utah.

Production by Districts

In 1926 the mines in Utah produced about 15,631,000 tons of ore, an increase from 14,479,247 tons in 1925. Of this total the Bingham district produced about 14,405,100 tons as compared with 13,140,350 tons in 1925. The estimated production of the district was 116,665 ounces of gold, 3,287,670 ounces of silver, 247,990,000 pounds of copper, 107,113,100 pounds of lead, and 50,054,100 pounds of zinc.

The mines of the Tintic district produced 550,717 tons of ore and old tailings, as compared with 553,153 tons in 1925. The estimated production of the district was 41,865 ounces of gold, 8,419,700 ounces of silver, 4,432,700 pounds of copper, 90,516,900 pounds of lead, and 8,918,000 pounds of zinc. The mines that produced more than 5,000 tons of ore during the year were the Tintic Standard, Chief Consolidated, Eagle & Blue Bell, Victoria, Mammoth and Plutus.

The shipments of ore, concentrate and tailings from the Park City region increased from 218,118 tons in 1925 to

312,792 tons in 1926. The estimated output of the district was 17,571 ounces of gold, 6,680,300 ounces of silver, 2,138,900 pounds of copper, 70,177,800 pounds of lead, and 31,007,800 pounds of zinc. There was a marked increase in the milling ore mined, but a decrease in silver, copper, and lead.

Mines in the Big and Little Cottonwood districts produced 10,389 tons of ore, from which 176 ounces of gold, 187,350 ounces of silver, 280,100 pounds of copper, 2,672,750 pounds of lead, and 495,000 pounds of zinc were recovered. The large producers were the Cardiff, Mineral Veins, and Michigan Utah mines.

From Ophir and Stockton shipments of lead ore and mill ore amounting to about 35,800 tons were made by the Bullion Coalition, Stockton Lead, and Keystone Development companies. The mill of the Ophir Hill Consolidated Co. was idle. In Beaver County the Moscow Silver Mines Co. produced much lead ore, and the Horn Silver Mining Co. was productive from crude ore and old tailings.

Washington

A General Decrease in the Quantity and Value of All Metals Produced is Found.

THE value of the gold, silver, copper, lead and zinc produced from ore mined in the State of Washington in 1926 was $881,000 as compared with $1,092,464 in 1925, according to estimates made by C. N. Gerry, of the Bureau of Mines. There was a general decrease in the quantity and value of all metals as well as the average metal prices.

The production of gold decreased from $230,253 in 1925, to $188,100 in 1926, as a result of the closing of the Boundary Red Mountain mill in Whatcom County. The output of the Republic district, which produced nearly all the gold, increased from $133,809 in 1925, to $155,400 in 1926, although the Knob Hill property was closed in March, after producing siliceous ore for 16 years. The Quilp mine was the only one which made regular shipments throughout the year and the Last Chance mine started producing after being idle nearly two years. The Boundary Red Mountain Mining Co. did only development work. The Kittitas dredge at Liberty produced considerable gold.

The output of silver in the state decreased from 166,425 ounces in 1925, to 159,000 ounces in 1926. The Dominion Silver Lead Mining Co., near Colville, was the largest producer of silver in the state, and it was followed by the Quilp and Last Chance mines at Republic, and the Sunset mine near Index. The United Silver-Copper Co., at Chewelah, and the Santa Rita mine near Springdale, Stevens County, were idle.

The output of copper decreased slightly from 1,159,057 pounds in 1925, to 1,100,000 pounds in 1926. The Sunset Copper Co., near Index, increased its output slightly, but the United Silver-Copper Co., at Chewelah, was idle.

The output of lead decreased from 5,627,241 pounds, valued at $489,570 in 1925, to 4,500,000 pounds, valued at $373,500 in 1926. The Gladstone mine near Northport, in Stevens County, was by far the largest producer of lead in the state, and the company reported paying regular dividends amounting to $92,528 during the year. Other producers of lead were the Electric Point, near Northport; Dominion Silver Lead, at Colville, and Bella May mines, at Metaline Falls, but the Santa Rita mine was idle and shipments from Northport were somewhat curtailed.

The production of zinc recovered from concentrate was about 23 percent less than in 1925, as shipments from the Black Rock mine, near Northport, were curtailed. Some lead-zinc ore from Northport, Colville, and Metaline Falls was milled in custom plants.

NEW METHODS FOR RECOVERING MOLYBDITE

Two new leaching methods for the recovery of molybdite from the ore have been carefully tested by the Bureau of Mines, and are believed to have commercial possibilities. The bureau has also investigated the dielectric separation process, an undeveloped method which seems to have limited possibilities.

A rapidly increasing amount of molybdenum is being used in the manufacture of alloy steels, to which, in conjunction with other metals, molybdenum imparts many desirable properties. Much smaller amounts of molybdenum are used in metallic form for electrical equipment, in nonferrous alloys, and in chemical reagents, dyes, and various other chemical products.

Until recently molybdenum was added to steel in the form of ferro-molybdenum. At present, however, most of the molybdenum used in steel is added in the form of calcium molybdate; reduction and combination as alloy result from the contact of the molybdate with the molten steel. This change marks an important economy in the production of molybdenum alloys.

Ferromolybdenum usually contains 50 to 60 percent molybdenum; 2 percent carbon is the maximum for one grade and 0.5 for another. Calcium molybdate is sold containing about 42 percent molybdenum. The presence of appreciable amounts of phosphorus, sulphur, or any easily reducible metal is not usually tolerated in either ferromolybdenum or calcium molybdate.

The largest developed source of molybdenum is at Climax, Colo. It consists of an immense body of brecciated porphyry granitic rocks of several kinds in which molybdenite is very finely disseminated. The ore being mined and milled at present contains 0.8 to 1 percent sulphide of molybdenum and a varying amount of oxidized mineral up to 0.35 percent molybdenum trioxide. The larger part of the ore body, however, is more completely oxidized, and the economic recovery of the molybdite must be assured before this becomes available as a source of molybdenum.

Near Sweetwater, Nev., is a rich deposit of molybdenite and molybdite.

In one of the leaching methods tested by the Bureau of Mines metallurgists, the procedure is to extract the ore with hot soda solution, acidify with sulphuric acid, add a small amount of sodium acetate, and digest with lead sulphate. Molybdenum is completely precipitated as lead molybdate, which can be converted to molybdenum trioxide. In the other process the ore is extracted with warm, dilute sulphuric acid and the free acid completely neutralized with scrap iron. Molybdenum is completely precipitated as a hydrate of molybdenum dioxide nearly pure. By treating the hot roasted ore with chlorine practically complete separation of the molybdenum from all other ore constituents is obtained in one operation. The distillate is quite pure and is easily converted to molybdenum trioxide or calcium molybdate. The consumption of chlorine need not be heavy and the regeneration of chlorine for repeated use seems possible. Paper 399, Bureau of Mines, gives full information on this subject.

LARGEST TURBINE GENERATOR

The largest turbine generator for steel mill use will be installed by the Illinois Steel Co., at its Gary, Ind., plant by the General Electric Co. It will produce 30,000 kilowatts at 25 cycles, 6,600 volts, and will operate condensing.

The tendency of steel mills to use large prime movers is indicated, not only by this, but also by other similar installations to be made by other plants. The Tennessee Coal, Iron & Railroad Co., is soon to install two 20,000-kilowatt turbine generators, and another unit of the same size will be installed by the Bethlehem Steel Co., at Sparrow's Point, Md.

THE IRON ORE INDUSTRY IN 1926

According To Yearly Estimates Of United States Bureau Of Mines, Iron Ore Production Exclusive Of Ore Containing Five Percent Manganese, Increased Nine Percent Over 1925 Production—Lake Superior District Shipped 85 Percent

THE iron ore mined in the United States in 1926, exclusive of ore that contained 5 percent or more of manganese in the natural state, is estimated by the Bureau of Mines at 67,693,000 gross tons, an increase of 9 percent as compared with that mined in 1925. The ore shipped from the mines in 1926 is estimated at 69,141,000 gross tons, valued at $175,307,000, an increase of 8 percent in quantity and of 9 percent in total value as compared with the figures for 1925. The average value of the ore per gross ton at the mines in 1926 is estimated at $2.54; in 1925 it was $2.52. The stocks of iron ore at the mines, mainly in Michigan and Minnesota, apparently decreased from 10,795,630 gross tons in 1925 to 9,496,000 tons in 1926, or 12 percent.

The Bureau of Mines estimates are based on preliminary figures furnished by producers who in 1925 mined about 99 percent of the total iron ore. They show the totals for the principal iron-ore producing states, and, by grouping together certain states, the totals for the Lake Superior district and for groups of southeastern, northeastern, and western states.

Lake Superior District

About 85 percent of the iron ore shipped in 1926 came from the Lake Superior district, in which approximately 57,314,000 gross tons was mined and 58,759,000 tons was shipped, increases of 10 and 8 percent, respectively, as compared with the quantities mined and shipped in 1925. The ore shipped in 1926 was valued at $151,484,000, an increase of 9 percent. These totals include the ore from mines in southern Wisconsin and ore shipped by rail as well as by water from all mines, but exclude manganiferous ores that contained 5 percent or more of manganese in the natural state. The ore is chiefly hematite. The stocks of iron ore in this district apparently decreased from 9,468,624 gross tons in 1925 to 8,104,000 tons in 1926, or 14 percent. The stocks at the end of 1926 were about 2,260,000 tons less than the average for the preceding five years. The shipments of iron ore by water from the Lake Superior district in 1926 (including manganiferous iron ores), according to the Lake Superior Iron Ore Association, amounted to 58,537,855 gross tons, an increase of 8 percent as compared with these shipments in 1925. The average value of the ore at the mines in the Lake Superior district in 1926 was $2.58; in 1925 it was $2.57.

The mines in Minnesota furnished 69 percent of the total iron ore shipped from the Lake Superior district in 1926 and 59 percent of the total of the United States. The mines in Michigan furnished 28 percent of the Lake shipments and 24 percent of the grand total.

Southeastern States

The southeastern states, which constitute the second largest iron-ore producing area, including the Birmingham and Chattanooga districts, mined approximately 7,253,000 gross tons of iron ore in 1926, a decrease of 3 percent as compared with 1925. The shipments of iron ore from these states to blast furnaces in 1926 amounted to 7,249,000 gross tons, valued at $15,720,000, a decrease of 0.3 percent in quantity but an increase of 4 percent in value as compared with the quantity and value of the shipments in the previous year. The ore consists mainly of hematite; brown ore and magnetite come next in order. The average value of the ore produced in these states in 1926 per gross ton was $2.17; in 1925 it was $2.08. Conditions in Alabama and Missouri seem to have been more favorable during the year than in other parts of the South. The stocks of iron ore at the mines in this group of states, mainly in the Birmingham district, increased from 971,550 gross tons in 1925, to 975,000 gross tons in 1926. These stocks are about 349,000 tons more than the average for the preceding five years.

The northeastern states, which include the Adirondack district, New York, and the Cornwall district, Pennsylvania, in 1926 mined 1,954,000 gross tons of iron ore and shipped 1,959,000 tons, valued at $6,398,000, increases of 50 percent in the quantity mined, 31 percent in the quantity shipped and 33 percent in value of shipments as compared with 1925. Production in the Adirondack and Cornwall districts and at Ft. Montgomery, N. Y., and Mt. Hope, N. J., was on an enlarged scale during 1926. The stocks of iron ore in this group of states increased from 341,357 gross tons in 1925 to 405,000 tons in 1926. These stocks are considerably less than usually carried over at these mines, being about 213,000 tons below the average for the preceding five years. The average value of the ore in these states in 1926 per gross ton was $3.27; in 1925 it was $3.22. Most of this ore is magnetite.

Western States

The western states that ordinarily produced iron ore, named in order of their importance, are Wyoming, Utah, New Mexico, Colorado, Montana, and California. Occasionally Idaho, Nevada, and Washington contribute small quantities. All the ore from Wyoming, New Mexico, and Colorado and most of that from Utah is used for the manufacture of pig iron. Much of the remainder is used as a flux in smelting copper and the precious metals. It is estimated that the western states mined in 1926 approximately 1,172,000 gross tons of iron ore, and shipped 1,174,000 tons, valued at $1,705,000, (*Continued on page* 117)

ESTIMATES OF IRON ORE MINED AND SHIPPED IN THE UNITED STATES IN 1926 AND ACTUAL OUTPUT IN 1925

District	Ore mined (gross tons) 1925	Ore mined (gross tons) 1926	Ore shipped 1925 Gross tons	Ore shipped 1925 Value	Ore shipped 1926 Gross tons	Ore shipped 1926 Value
Lake Superior:						
Michigan	14,490,529	15,357,000	15,254,003	$40,926,315	16,728,000	$44,135,000
Minnesota	36,856,244	40,662,000	38,022,237	96,083,485	40,787,000	104,180,000
Wisconsin	817,149	1,295,000	933,214	2,260,388	1,244,000	3,169,000
	52,163,922	57,314,000	54,209,454	139,270,188	58,759,000	151,484,000
Southeastern States:						
Alabama	7,093,250	6,858,000	6,891,081	14,134,677	6,855,000	14,507,000
Georgia	78,835	71,000	79,488	231,683	71,000	201,000
Missouri	40,043	120,000	40,043	153,420	120,000	525,000
North Carolina .	22,011	15,000	22,011	49,511	15,000	32,000
Tennessee	164,717	139,000	164,073	369,144	137,000	316,000
Virginia	96,272	50,000	76,302	174,454	51,000	139,000
	7,495,128	7,253,000	7,272,998	15,112,889	7,249,000	15,720,000
Northeastern States:						
New Jersey	202,942	208,000	164,523	678,021	209,000	915,000
New York	141,534	645,000	413,517	1,988,735	662,000	3,163,000
Ohio	2,410	1,101,000	2,410	2,154,623	1,088,000	2,320,000
Pennsylvania ...	955,955		917,255			
	1,302,841	1,954,000	1,497,705	4,821,379	1,959,000	6,398,000
Western States	946,106	1,172,000	944,606	1,592,430	1,174,000	1,705,000
Grand total ...	61,907,997	67,693,000	63,924,763	160,796,886	69,141,000	175,307,000

THE COPPER MINING INDUSTRY IN 1926

Outstanding Features Of Copper Industry In 1926 Were Record-Breaking Imports And Domestic Consumption—Production Approximately Four Percent Higher Than 1925, As Largest Peace-Time Output Is Recorded

OUTSTANDING features of the copper industry in 1926 were record-breaking imports and domestic consumption, according to the Bureau of Mines. European countries did not make the demands on the market that it was anticipated they would, and, instead of increasing, exports to Europe decreased largely in 1926. Exports to France, however, showed a notable increase. Both smelter and refinery production showed small increases over previous peace-time records, and while stocks of refined copper increased, stocks of blister copper decreased sufficiently so that there was little change in total stocks.

The smelter production of copper from domestic ores in 1926 as determined by the Bureau of Mines, from reports of the smelters showing actual production for 11 months and estimated production for December, was 1,742,000,000 pounds, compared with 1,675,000,000 pounds in 1925. The 1926 production is the largest peace-time output, being approximately 4 percent higher than that of 1925, which was heretofore the highest recorded with the exception of the war years, 1916, 1917, and 1918. The estimated smelter production from domestic ores for December, as reported by the smelters, was 157,000,000 pounds, 13,000,000 pounds higher than the average for the 11 months preceding. The estimated production for December, 1925, was 137,000,000 pounds, which was below the monthly average for that year.

The production of new refined copper from domestic sources, determined in the same manner as smelter production, was about 1,738,000,000 pounds, compared with 1,683,000,000 pounds in 1925. In 1926 the production of new refined copper from domestic and foreign sources amounted to about 2,346,000,000 pounds, compared with 2,205,000,000 pounds in 1925, an increase of 141,000,000 pounds or 6 percent. The production of secondary copper by primary refineries increased from 198,000,000 pounds to about 207,000,000 pounds in 1926, or 9,000,000 pounds, so that the total primary and secondary output of copper by the refineries was 150,000,000 pounds higher in 1926, being about 2,553,000,000 pounds compared with 2,403,000,000 pounds in 1925.

The imports of unmanufactured copper during the first 11 months of 1926, according to the Bureau of Foreign and Domestic Commerce, amounted to 715,782,075 pounds, a monthly rate of 65,000,000 pounds compared with 652,973,407 pounds for the entire year 1925, a monthly rate of over 54,000,000 pounds. The imports for 1926 will undoubtedly be record-breaking as the total imports for 11 months are only 53,000,000 pounds below the record annual total of 1924, 768,813,731 pounds.

The exports of copper during the first 11 months of 1926 amounted to 864,786,512 pounds compared with 1,082,369,439 pounds exported during the entire year 1925. Exports for November were the highest recorded in any of the first 11 months, and if December exports are at the same rate, the total for the year will be about 959,000,000 pounds, a decrease of 123,000,000 pounds from those for 1925. It does not seem likely, however, that the exports in December will be as high as those for November. In the first 11 months of 1926, 811,134,189 pounds of refined copper in ingots, bars, rods, and other forms, were exported. Of this quantity the United Kingdom received 177,131,758 pounds, the highest amount, France was next with 161,332,657 pounds, and Germany third, with 136,325,069 pounds. In the entire year 1925 the United Kingdom received 218,006,841 pounds, France, 146,595,492 pounds, and Germany, 230,411,284 pounds. When December's exports are added to the 11 months' total, Germany will show a tremendous decrease for the year, the United Kingdom a smaller decrease, and France will show a substantial increase.

Refineries report that at the end of 1926 approximately 137,000,000 pounds of refined copper would be in stock, an increase from 124,000,000 pounds at the end of 1925. Stocks on hand November 30 were reported to be 145,000,000 pounds, so that stocks of refined copper were estimated to drop 8,000,000 pounds in December. It is estimated that stocks of blister copper at the smelters, in transit to refineries, and at refineries, and materials in process of refining, were 415,000,000 pounds on December 31, compared with 432,000,000 pounds at the end of 1925, a decrease of 17,000,000 pounds. Smelter and refineries estimated that stocks on November 30 were 435,000,000 pounds, so that a drop of 20,000,000 pounds was estimated in these stocks in December. The increase of 13,000,000 pounds in refined stocks during the year and the decrease of 17,000,000 pounds in stocks of blister and unrefined materials, make a net decrease in stocks of 4,000,000 pounds.

The quantity of refined copper withdrawn on domestic account during the year was about 1,584,000,000 pounds, compared with 1,401,000,000 pounds in 1925, an increase of 183,000,000 pounds. The year 1918 is the only one in which domestic withdrawals surpassed those of 1926. The method of calculation is shown in the table.

NEW REFINED COPPER WITHDRAWN FROM TOTAL YEAR'S SUPPLY ON DOMESTIC ACCOUNT, 1925-1926, IN POUNDS

	1925	1926
Refinery production of new copper from domestic sources	1,683,000,000	1,738,000,000
Refinery production of new copper from foreign sources	521,000,000	608,000,000
Imports of refined copper (December, 1926, estimated)	100,000,000	132,000,000
Stocks of new refined copper January 1	243,000,000	124,000,000
	2,547,000,000	2,602,000,000
Exports of refined copper (ingots, bars, rods or other forms, December, 1926, estimated	1,022,000,000	881,000,000
Stocks December 31	124,000,000	137,000,000
	1,146,000,000	1,018,000,000
Total withdrawn on domestic account	1,401,000,000	1,584,000,000

IRON ORE INDUSTRY IN 1926

(*Continued from page* 116)

increases of 24 percent in the quantities mined and shipped and 7 percent in value of shipments as compared with 1925. The ore comprises hematite, magnetite, and brown ore. The increase in output in this group of states in 1926 reflects the more active operations at mines in the Hartville district, Wyoming, in the Fierro district, New Mexico, and near Orient, Colo.

IMPORTS AND EXPORTS

The imports of iron ore reported for the 11 months ended November 30, 1926, amounted to 2,350,406 gross tons, valued at $5,401,499, or $2.30 a ton. The imports for the year 1925 were 2,190,697 gross tons, valued at $6,895,229, or $3.15 a ton. The reported exports of iron ore for the 11 months ended November 30, 1926, amounted to 868,405 gross tons, valued at $3,379,331, or $3.89 a ton, as compared with exports for the entire year 1925 of 630,521 tons, valued at $2,411,093, or $3.82 a ton. These statistics of imports and exports were compiled from the records of the Bureau of Foreign and Domestic Commerce, of the Department of Commerce.

LEAD AND ZINC PRODUCTION IN 1926

Mine Output Of Lead Decreased Slightly Under 1925, With Mine And Smelter Output Of Zinc Showing Gain—Tri-State District Produced Largest Amount With Utah And Idaho Occupying Second And Third Place

THE recoverable lead contained in ore mined in the United States in 1926 was about 672,000 short tons, as compared with an output of 684,073 tons in 1925, according to figures compiled by the Bureau of Mines. The output of soft lead by mines of the Mississippi Valley and a small output from the eastern states amounted to about 305,000 tons, and that of argentiferous lead by mines of the western states amounted to about 367,000 tons. Corresponding figures for 1925 were 320,052 tons from the Mississippi Valley and the eastern states, and 364,021 tons from the western states. The largest output came from the southeastern Missouri district and amounted to about 200,000 tons, as compared with 208,915 tons in 1925. The output of Utah came next and amounted to about 146,000 tons, compared with 153,335 tons in 1925. Idaho ranked third with an output of about 133,000 tons, compared with 126,521 tons in 1925.

The imports of lead in ore for eleven months amounted to 50,842 tons, of which 69 percent came from Mexico and 22 percent came from South America. The content of lead in ore and base bullion in bonded warehouse on October 31 was 125,295 tons.

The price at Joplin of 80 percent lead concentrates was $115 a ton at the beginning of the year. In three weeks it had risen to $122.50, which was the highest price paid during the year. The trend of prices was downward during the next four months and concentrates sold for $90 late in May and during the first week in June. A recovery then began which brought the price to $112.50 the last of July, where it remained for two months. Lower prices prevailed during the remainder of the year, and at its close the price was $97.50.

The output of primary domestic desilverized lead was about 368,000 tons; of soft lead about 248,000 tons, and of desilverized soft lead about 56,000 tons, making a total output from domestic ores of about 672,000 tons of refined lead. Corresponding figures in 1925 were 345,429 tons of desilverized lead, 260,560 tons of soft lead, and 48,932 tons of desilverized soft lead, making a total of 654,921 tons. The output of lead smelted and refined from foreign ore and bullion was about 128,000 tons, as compared with 112,048 tons in 1925. The total lead smelted or refined in the United States in 1926 was thus about 800,000 tons, as compared with a total of 766,969 tons in 1925—a gain of about 4 percent. The output of antimonial lead in 1926 was about 20,000 tons, as compared with 19,667 tons in 1925.

The imports of refined pig lead for eleven months amounted to 9,231 tons, of which 96 percent came from Mexico. The base bullion imported during the same period contained 70,488 tons of lead, almost wholly from Mexico. The exports of lead of foreign origin amounted to 60,251 tons, as compared with 98,564 tons exported in 1925. Exports of lead of domestic origin amounted to 3,732 tons, as compared with 4,955 tons exported in 1925. Exclusive of stocks of lead at smelters and refineries and of the amount of lead exported with benefit of drawback, for which figures are not available, it is calculated that the amount of lead available for consumption in 1926 was about 744,000 tons, as compared with 655,655 tons in 1925.

According to figures published by the American Metal Market, the average quoted price of lead for prompt delivery at New York for the year was 8.45 cents a pound, as compared with an average selling price of 8.7 cents in 1925. The quotation at the beginning of the year was 9.37½ cents and in the closing days of the year it was 7.8 cents. The following are the average monthly prices on lead for prompt delivery at New York, in cents a pound:

January	9.3	July	8.6
February	9.2	August	8.9
March	8.5	September	8.8
April	8.0	October	8.4
May	7.8	November	8.0
June	8.1	December	7.8

Zinc Mining and Smelting

The recoverable zinc contained in ore mined in the United States in 1926 was about 773,000 tons, as compared with 710,847 tons in 1925, a gain of 9 percent. The output of the eastern states was about 103,000 tons (78 percent from New Jersey), of the central states about 465,000 tons, and of the western states about 205,000 tons. All important zinc-producing states in the West reported increased output as compared with 1925. The greatest gain was made in Utah, which showed an increase of 75 percent. Idaho's gain was 68 percent, and the Joplin district made a 4 percent increase over its large output of 1925.

The imports of zinc in ore for eleven months amounted to 13,567 tons. The zinc content of concentrates exported during eleven months amounted to 93,336 tons. The zinc content of zinc ore in bonded warehouse on October 31 was 14,410 tons.

The price at Joplin of 60 percent zinc concentrates was $56 a ton at the beginning of the year. By the first of May it had fallen to $45. It rose gradually to $50 in July and remained at or slightly below that figure during the rest of the year, the price throughout December being $46.

The output of primary metallic zinc from domestic ores in 1926 was about 605,000 tons and that from foreign ores was about 7,000 tons, a total of 612,000 tons, as compared with 555,631 tons from domestic ores and 17,315 tons from foreign ores, a total of 572,946 tons in 1925. In addition to the output of primary zinc there was an output of about 42,000 tons of redistilled secondary zinc, as compared with 39,181 tons in 1925, making a total supply of distilled and electrolytic zinc in 1926 of about 654,000 tons, composed of 190,000 tons of high grade and intermediate, 93,000 tons of select and brass special, and 371,000 tons of prime western zinc.

The imports of slab zinc for eleven months amounted to only 20 tons. The exports of slab zinc made from domestic and foreign ores amounted to 42,563 tons, including 4,348 tons of rolled zinc. The stock of zinc reported at smelters November 30 was about 16,000 tons. No slab zinc was reported in warehouse. The apparent consumption of primary zinc in 1926 was about 566,000 tons, as compared with 500,097 tons in 1925.

The total number of retorts at zinc smelters that operated during all or a part of the year was about 122,000. Of that number, about 89,000 were reported in operation at the end of November, and about 90,000 were expected to be in operation at the end of the year.

Figures published by the American Metal Market give an average quoted price of 7.35 cents a pound for prime western zinc at St. Louis in 1926, as compared with an average selling price for all grades in 1925 of 7.6 cents. At the opening of the year the quotation was 8.75 cents a pound and a quotation of 7.05 cents prevailed through most of December. The following are the average monthly prices on prime western zinc at St. Louis, in cents a pound:

January	8.5	July	7.4
February	7.8	August	7.4
March	7.3	September	7.4
April	7.0	October	7.3
May	6.8	November	7.2
June	7.1	December	7.9

UTILIZATION OF MANGANIFEROUS IRON ORES

Experimental Work Of Bureau Of Mines And University Of Minnesota Detailed In Special Bulletin—Results Interesting

RESEARCH on the utilization of manganiferous iron ores has been undertaken by the North Central Experiment Station of the Bureau of Mines, located at Minneapolis, Minn., in cooperation with the University of Minnesota School of Mines Experiment Station. The investigation may be divided as follows:

1. The use of manganiferous iron ores with respect to effect on blast-furnace operation; effect of high-manganese pig iron on the quality of steel; decrease in ferromanganese by the use of high-manganese pig iron; and desulphurization of steel through the presence of manganese.

2. The utilization of manganiferous iron ores in the production of ferromanganese.

3. The use of 6 to 10 percent manganese alloys as additions to steels containing more than 0.3 percent carbon.

Manganiferous iron ores, differing in composition, occur in several districts in the United States. The Cuyuna district of central Minnesota, however, contains the most extensive deposits as yet discovered; they have also the advantage of proximity to the Great Lakes. These ores are now finding an increasing market as sulphur scavengers in the blast furnace and for producing high-manganese pig iron.

Cuyuna ores may be divided into two classes—the so-called high-phosphorus, low-silica, or brown ores; and the high-silica, low-phosphorus, or black ores. It has been estimated that the manganese in the reserves of the black ores is only one-eighth of that in the reserves of brown ores. Increasing amounts of the brown ores have been shipped the last few years and have been mixed with other ores to regulate the manganese content of the pig iron made in the blast furnace. The use of these ores may therefore be taken as an index of the popularity of high-manganese pig iron. The brown ores are high in moisture and many of them have an alumina content that is high in comparison with the silica.

The behavior of a blast-furnace burden composed of 100 percent Cuyuna brown ore has never been determined on a commercial scale. The black or high-silica ores were used commercially during the World War, and considerable data are available regarding the results obtained. It seemed desirable to make some blast-furnace tests of the brown ores to determine the slag composition that gives the best recovery of manganese and to ascertain whether the ores would offer any difficulty in smelting. It was also important to know the fuel requirements and the grade of alloy which could be made from these ores. In addition, blast-furnace tests were needed to furnish a quantity of metal for use in developing methods of separating the iron and manganese in low-grade spiegel or manganiferous pig iron. As tests with a small commercial furnace were too expensive to warrant serious consideration, the development of an experimental blast furnace for making the tests was undertaken by the Bureau of Mines. This development required several years and called for the exercise of much patience by all persons concerned. An experimental furnace, in addition to being a necessary adjunct to the manganese problem, also had great promise as an instrument for fundamental blast-furnace research.

After 35 tests with 16 furnaces, ranging in height from a few feet to 20 feet, had been made, a satisfactory furnace was designed by the Bureau of Mines and erected by the University of Minnesota.

As a result of numerous tests conducted with this experimental furnace, there have been obtained fundamental data on the blast furnace and information regarding the smelting of the brown Cuyuna ores. The runs in the experimental furnace have also yielded 134 tons of metal which are now available for a study of the problem of separating the iron, manganese, and phosphorous. If their separation can be made, the production of a higher-grade manganese alloy low in phosphorus will be possible. The manganese content of the metal on hand ranges from 2 to 15 percent; the phosphorus is uniformly high, about 0.6 percent. Sulphur is present in negligible quantities.

At several plants in this country low-grade spiegeleisen is used to recarburize and deoxidize rail heats. This practice would furnish a market for Cuyuna ores were not their phosphorus content so high. Low-carbon steel can not be made by this method, but a considerable tonnage of steel containing 0.3 percent and more carbon is produced annually. If the trouble due to the phosphorus can be overcome by mixing brown ores with black low-phosphorus ores, or if phosphorus can be eliminated in a basic electric furnace, the use of manganiferous ores can be increased.

At present not enough data are available for determining the most efficient way of utilizing these ores. More information on their present use in the blast furnace is needed. The recovery of manganese in the pig iron and the extent of improved desulphurization should be determined. Although the practice of using high-manganese pigs to obtain residual manganese seems to be increasing, there are still differences of opinion as to what benefits are realized. The information needed must be sought through the cooperation of steel companies and blast-furnace operators, inasmuch as they alone can furnish comparative data. The development of new methods for utilizing the Cuyuna ores must depend on experiments. The first step in the process, the production of low-grade spiegel in the blast furnace from 100 percent Cuyuna ores, has been completed. Small-scale converter and open-hearth tests are now in progress. Some phases of the problem can be studied on a laboratory scale. It was for the purpose of determining more accurately the technologic problems and the economic conditions that affect the use of these ores that this investigation has been undertaken.

Further details regarding this investigation are contained in Bureau of Mines Technical Paper 393 "Utilization of Manganiferous Iron Ores," by T. L. Joseph, P. H. Royster and S. P. Kinney, which may be obtained from the Superintendent of Documents, Washington, D. C., at a price of 10 cents.

Brazilian Exports of Manganese to U. S. Increase

Practically all of the manganese ore exported from Brazil is shipped from Rio de Janeiro, whose shipments to the United States during the first ten months of the last year amounted to 253,640 long tons valued at $3,002,499, as compared with 200,612 tons valued at $2,465,297 in the January-October period of 1925, states a report made public by the Department of Commerce.

These shipments are largely dependent upon the available railway facilities from the mines to Rio de Janeiro. It is of interest that of the October shipments in 1926 79.31 percent was handled by the Companhia Meridional de Mineracaol.

The following table shows the monthly shipments of the present year compared with the corresponding ones for 1925:

MONTHLY EXPORTS OF MANGANESE ORE FROM BRAZIL

Month	1925	1926
January	13,147	25,500
February	28,493	38,700
March	7,600	20,500
April	.....	7,200
May	27,000	23,700
June	27,800	40,105
July	29,400	31,400
August	20,900	19,435
September	15,300	17,400
October	30,972	29,700
	200,612	253,640

PRELIMINARY REPORT OF THE MANGANESE SITUATION, 1926

Large Increase In Production Of Ore Containing Ten To Thirty-Five Percent Manganese—Production High-Grade Ore Decreased

DOMESTIC shipments of manganese ore containing 35 percent and more of metallic manganese totaled in 1926 approximately 44,000 long tons, valued at $1,185,600, according to preliminary figures compiled by the Bureau of Mines. This is a decrease of 55 percent from the 1925 shipments, amounting to 98,324 tons. The increase in average value per ton of all ore shipped in 1926 is due to the fact that the ratio of the shipments of chemical ore to those of metallurgical ore greatly increased. The shipments of metallurgical ore amounted to 24,200 tons, valued at $332,000, while those of 1925 were 76,173 tons, valued at $954,799. The shipments of chemical ore in 1926 amounted to 19,800 tons, valued at $853,600, while those of 1925 were 22,151 tons, valued at $902,970.

In 1925 the Butte, Mont., district shipped 47,507 tons of manganese ore and in 1926 this district shipped 1,718 tons of manganese ore. The decrease indicated is due to the fact that in 1925 the Emma mine shipped 47,469 tons and in 1926, 1,718 tons. In July, 1926, shipments from the Crescent mine, Washington, were discontinued. The ore was bottomed at a vertical distance of 400 feet, and the continuation of the orebody was not found by diamond drilling. No high grade ore was produced during the year from Leadville, Colo. Shipments of manganese ore from Arizona and Georgia showed increases over 1925. The production from the Batesville-Cushman district, Arkansas, in 1926 showed a decided decrease from 1925, and must be attributed in part to the exhaustion of the ores minable at prevailing prices.

The quoted price of high grade manganese ore during the year has been relatively constant. A material tonnage has been sold at a figure far below those quoted; the average price for the year was approximately 40 cents a unit, c. i. f. Atlantic seaboard.

Figures furnished by the Bureau of Foreign and Domestic Commerce show that during the first 11 months of 1926 the metallic manganese content of manganese ore imported amounted to 327,258 tons, exclusive of imports from Cuba. The imports from Cuba for 11 months are given as 13,937 tons of manganese ore. For the first 11 months the manganese content of ferromanganese imported is given as 36,471 tons. Assuming an average manganese content of 48 percent for all ores imported, the gross weight of the ores imported, including that of Cuba, during this period was approximately 703,000 tons. Assuming the imports of December to be equivalent to those of November, the total for the year would be about 745,000 tons, as compared with 615,000 tons in 1925, an increase of 130,000 tons. This large increase may be accounted for by the decrease in imports of ferromanganese and to the increase of stocks in this country. A portion of this increase during 1926 was in part due to the increase in the production of steel. The metallic manganese in the imports of ore from Russia amounted to 126,201 tons, or on a 50 percent basis, 252,400 tons of ore, for the first 11 months of 1926, as compared with 114,537 tons for the entire year 1925. The exports from the Tchiatouri deposits to the United States amounted to 177,295 tons of ore for the first 10 months of 1926. The metallic manganese in the imports from Brazil for the first 11 months of 1926 amounted to 125,202 tons, compared with 109,650 tons for the entire year 1925. Imports in terms of manganese content from British India will show an increase for 1926, being 25,689 tons imported for the first 11 months as compared with 23,504 tons for the entire year 1925. Imports from the Gold Coast of West Africa for the first 11 months were 41,683 tons, compared with 31,750 tons for 1925.

The shipments of domestic ores containing from 10 to 35 percent manganese increased in 1926 from 267,252 tons, valued at $915,316 to approximately 366,500 tons, valued at $1,119,000. This increase is due to the large increase in production in Minnesota and New Mexico, whereas production in Colorado and Georgia decreased.

The domestic shipments of ore containing 5 to 10 percent manganese show a decided decrease over those of 1925. This decrease is due to the fact that the Ottawa mine in Wisconsin produced 347,639 tons of ore containing only 4.8 percent manganese in the natural state. Shipments from Minnesota increased from 741,409 tons in 1925 to 810,769 tons in 1926, and those from Wisconsin decreased from 404,014 tons containing over 5 percent manganese to 347,639 tons containing 4.8 percent.

The apparent outstanding feature of the year has been the increase in the domestic manufacture of ferromanganese. During the year the Bethlehem Steel and Iron Co. placed ferromanganese on the market. This action resulted in a decrease in price from $115 to $88. At present ferromanganese is quoted at $100 c. i. f. Atlantic seaboard, duty paid. With the exception of the ferromanganese of Swedish manufacture the present price at which ferromanganese is selling is said to be below the cost of manufacture in foreign countries.

VALUE OF TAXPAYERS' ASSOCIATIONS

(*Continued from page* 89)

General statements, aggregates and totals, however significant to the tax student or expert, make slight appeal to the layman. His interest is first engaged through something he already understands or that affects him directly and locally. The experience has been that when a taxpayer becomes personally interested in any phase of the tax problem, even though it be a minor one, he usually continues his interest and activity until they embrace his entire problem. He soon becomes a persistent and intelligent inquirer into what he gets, or does not get, for his tax money. He establishes contacts with his public officials as an advisor, as well as a critic. He scans candidates for something besides partisanship or personality when he determines for whom he will vote, and urges his friends to do likewise. In general, he gives his tax problem the attention its importance to him merits.

Definite accomplishments of taxpayers' associations include complete state and local budgetary systems in several Western states, a modified viewpoint on bond proposals and substantial reductions in tax levies. One state shows reduced levies in more than half its counties and a substantial reduction in the average levy for the entire state this year. Another claims the United States record in the reduction of state and local taxes. Another points to the repeal of a law that was said to have kept more than $40,000,000 of investment out of the state in a single year. All of them can point to numbers of bond proposals that were modified or defeated upon showings of fact by the taxpayers' associations that the proposed issues were unnecessary, excessive or otherwise undesirable.

Experience in the Western states indicates that associations organized and conducted as outlined will be permanent and beneficial. They have grown continnously in membership, influence and public esteem. It is believed that they have already fully established their value in many ways, especially through demonstration that united and aggressive participation of large numbers of taxpayers in their own public affairs tends to secure more efficient state and local government at less cost.

INDUSTRIAL COOPERATION IN WEST VIRGINIA

Greatest Aid To Cooperation Is The Unhampered Operation Of Supply And Demand—Conditions In West Virginia Field Encouraging—Recent Advance In Wages And Still More Recent Rescinding Of That Advance Accepted In Fine Spirit And Understanding

By JOSIAH KEELY *

NOW that West Virginia is a contender for first place in the production of bituminous coal, the question of industrial relations making this possible may carry an added interest.

Some years ago there might have been doubtful credit in assuming a boastful attitude over the amount of work wrung from those toilers whom "Mother Jones" was pleased to call "industrial slaves"; but in these days of the new freedom, when men work, or do not work, join unions, or refrain from joining, buy from the company stores or from Sears & Roebuck, the magnificent production of 1926 must be significant of something other than oppression, for there is no man-made economic machinery in all the vast coal fields of West Virginia sufficient to coerce labor into its present attitude of mind, especially as West Virginians have the reputation of being right willful. It must be something deeper.

When we speak of prosperity and good will, the income-tax returns shows the prosperity a little one-sided, but the good will seems to be mutual, and, since we are examining industrial relations, there must be some reason why free mountaineers have apparently abandoned a policy of organized strife to accept what the business will stand.

West Virginia has produced between one hundred and thirty and one hundred and forty million tons of non-union coal on a scale of wages slightly above that of 1917. That scale is: $4.20 to $5.00 for day labor; 42 to 49 cents per ton for shooting and loading coal; and 10 to 11 cents for cutting. The average yearly earnings of the men, in very many cases, have been higher than during the war, when car shortage cut down the working time. If you figure around three hundred working days and ten tons per day for miners, you have a fair idea of the result in dollars and cents. When you consider that many miners load fifteen to twenty tons rather regularly, and that two machine men average better than one hundred tons per day in the cutting, there is room for some pretty high individual scores.

The pay-day lay-off is a rather interesting index to industrial cooperation as well as to earning ability. It may be difficult to demonstrate, but the steady earning power seems to offer less inducement to loaf than the scattered "killings" made under the high wage. Probably no class of industrial labor takes as many days off as the miner. This is not meant facetiously. Even when work is offered every day his terms of employment do not require that he be at his place every day, unless working for Henry Ford, but as these lay-offs are a source of annoyance, the matter of frequency shows something of how a man is getting along with his boss. West Virginia has no serious ground of complaint for irregularity in that respect.

It is not the intention of the writer to indulge in propaganda, nor to write controversially about the perplexing problem of trades unions. Things have happened which, seemingly, have advanced the cause of industrial cooperation in West Virginia. And, inasmuch as it has, in the main, just happened without any elaborate campaign, or program, it may be worthy of the analysis of anyone interested in industrial cooperation, be he anti or pro.

There may be some operators who think they are responsible for driving the miners' union out of their camps, and it is true that they may have taken a firm position and refused to do business with a union, but then most of them would have liked to do that many years ago, and could not. For fifteen or twenty years the United Mine Workers of America was a powerful and compelling organization, dominating perhaps seventy or eighty percent of the industry, in one way or another. Almost the only way anyone ever cooperated with the U. M. W. A. was to do their bidding. In 1923, recognizing that a full run in all the fields meant only a half-time proposition, a demand was made on the basis of running half time, paying double wages, and collecting double prices for the coal. But unfortunately for the protagonist of artificial systems, there are factors that can not be controlled. Coal orders will probably never be distributed so as to give each and every company its half-time work to fit in with the double-wage-double-price program. Natural and economic laws do not work part time, but full time and relentlessly. Just when this big majority of the industry was all set for trial of this artificial plan, the minority started in a full-time program on the 1917 wage scale. As they had a good coal and a good price, the public bought; and sixty percent of requirements was taken care of right from the start by this thirty percent running full time and not in the combination. What continued to happen is a matter of three years' record.

Now, most men are so constituted that when the rain from heaven falls upon their unprotected heads, they make the best of it and may even thank God it is no worse; but if that same amount of water comes out of a bucket, discharged from an open window, they may even break a commandment or two. So it was with men who saw natural laws working in the coal fields. It was one thing to be out of work when there was no work, and quite another when held back by artificial inhibitions. Right in the heart of those fields where the pact was sacred some mines worked and some did not, depending on laws natural and economic. The reasons were too plain to be missed, and the evolution of the thing went on.

It will always be a matter of controversy whether those West Virginia mines that felt they were released from the Jacksonville agreement extricated themselves with honor, but the greater majority of the state were free to open their mines to anyone who wanted to work. For the first time in a dozen years natural economic laws operated unhampered, and while the "perfidy" of the northern West Virginia operators was carried even to the White House door, little was said, in public, about those thousands of mine workers good and true who left their posts in Ohio, Indiana, and Illinois for untrammeled labor conditions in West Virginia.

As the year of 1926 advanced production advanced in West Virginia even beyond 1924 and 1925, and there seems to be a growing feeling that the chief function of unionism is to make good times in the open-shop fields. With the hum of industry goes the feeling of good will. The bosses who have been heckled for years by pit committees and petty, trumped-up grievances have mellowed until, in some instances, they are almost human. Churches and Sunday Schools have taken on a new lease, and Scout organizations have sprung up where, a few years back, a boy would have been sneered out of town if caught making a vow to be couretous to men and kind to animals. This may sound like propaganda, but it is just one of those cases where the truth is mushier than fiction. There is a psychological reason for it. When two men, or women, have not been on speaking terms for years and suddenly make up their (*Continued on page* 149)

* General Manager, Cabin Creek Consolidated Coal Co., Kayford, W. Va.

LEGISLATIVE REVIEW

Congress Working At Top Speed Preparatory Winding Up Activities—Tax Revision Put Off Until New Congress Meeting In December—Silver Purchase Bill Nearing Enactment—Coal Legislation Defeated In Committee—Mine Proposals Conspicuous On Legislative Calendar

AN unusually large number of measures affecting the mining industry are receiving the attention of Congress. When this session closes at noon on March 4, it will mark the end of the Sixty-ninth Congress. As all uncompleted legislation expires with the end of a Congress those sponsoring measures are making efforts to have them passed upon as otherwise they will have to be newly introduced in the new Congress following and again go over the same legislative hurdles. Some measures have passed one house and efforts to put the finishing touches on the legislation are being exerted in the other house. Time is an important factor in the fate of some bills and their advocates are pressing at every point to put the measures through their final legislative stages before the gate is closed against them on March 4, when Congress will close up shop not to reconvene again until the first session of the Seventieth Congress in December.

While the Mexican and Nicaraguan situations are giving Congressmen concern lest they should involve the country in another war, and election and nomination contests have pressed themselves into the picture, there has been no let up by Congress in its attention to general legislative proposals.

Out of a long campaign extending over several years, proponents of coal legislation have emerged decisively defeated. By an overwhelming vote of 6 to 16 the House Committee on Interstate Commerce refused to report the bill to regulate the coal industry through the Bureau of Mines as a fact-finding agency, and giving the President emergency powers in event of strikes. There is still a possibility of such legislation, however, from the fact that Senate leaders have stated that they will support legislation on the subject which meets the President's approval. If the Senate should pass such legislation it would have to go before the House and its advocates might force consideration of the measure notwithstanding the unfavorable vote recently taken by the House committee. Some House leaders favor such legislation and their position might force action later if the measure is actively backed by the administration.

Despairing of favorable action by the House Mines and Mining Committee on a bill passed by the Senate to amend the war minerals relief act so as to permit settlement of claims arising out of the purchase of property and interest on borrowed money, friends of claimants have introduced measures to pay individual claims.

Legislation to turn over the mineral lands to the states which have been withheld by the Government from their school land grants is possible of passage. The Interior Department has agreed to turn back these lands if the states will lease the minerals, and legislation to carry out the plan is now before the House.

Advocates of the bill for the purchase of 15,000,000 ounces of silver at $1 per ounce to complete purchases under the Pittman silver act passed during the war are heartened by a favorable report on this bill by the House Banking Committee.

One of the first mining laws to be passed at this session was a bill which authorizes mineral leases on unallotted lands in executive order Indian reservations.

Amendment of the potash exploration law to overcome restrictions in connection with contracts with landowners has been proposed in bills introduced in both Houses.

Patents to copper deposits which must be produced by deep mining without an actual showing of mineral being required are proposed in a bill introduced in the House.

While sporadic efforts have been made to secure tax and tariff revision, these attempts are being gradually dissipated by the intention of congressional leaders not to touch these revenue measures until the next session. In anticipation of tax legislation, the Senate directed the Federal Trade Commission to investigate and report on stocks, dividends, and Senator Couzens, Republican, Michigan, who was chairman of the committee in the last session, which investigated and criticized administration of the Internal Revenue Bureau, presented a bill to transfer tax and tariff duty settlements from the Revenue Bureau and Customs Division of the Treasury Department to the Comptroller General, the independent auditing agency of the Government. Senator Frazier, Republican, North Dakota, proposed an inquiry as to cost of production of metal corporations and Representative Browning, Democrat, Tennessee, suggested an excise tax on steel and aluminum corporations based on their benefits from the tariff, to be used as an agricultural equalization fee.

A measure in the interest of increased protection to labor from industrial accidents was passed by the House. It creates the Bureau of Labor Statistics as a central Government agency for the collection and analysis of accident statistics and the study and exhibition of labor safety devices.

A giant power project for the West is proposed in a bill reported by the House Irrigation Committee. It provides for power development on the Colorado River under Government construction or lease of power plants.

Oil legislation is also before Congress. A bill by Senator Wheeler, Democrat, Montana, would permit contests against oil prospecting permits. He also proposes an investigation of oil and other concessions by Americans in other countries in their relation to international affairs. Other oil resolutions were introduced in connection with the Mexican situation growing out of the new law of Mexico requiring concessions to oil lands. These resolutions called on the State Department for information as to the companies affected and whether the Government had advised American interests to accept or reject the new conditions laid down by Mexico.

Congress has also been busy in passing the regular appropriations bill providing funds for operation of the Government departments during the new fiscal year beginning July 1.

Committees of Congress have been active in clearing their calendars of pending legislation in anticipation of the grand wind-up March 4.

Mine Leases

H. R. 12393. Enacted into law. This law authorizes mineral leases on unallotted Indian lands in various Western States. It provides:

"That the Secretary of the Interior is authorized to lease to citizens of the United States, or to any association of such persons or to any corporation organized under the laws of the United States or of any state or territory thereof, any part of the unallotted lands within any Indian reservation within the states of Arizona, California, Idaho, Montana, Nevada, New Mexico, Oregon, Washington, or Wyoming heretofore withdrawn from entry under the mining laws for the purpose of mining for deposits of gold, silver, copper, and other valuable metalliferous minerals and nonmetalliferous minerals, not including oil and gas, which leases shall be irrevocable, except as herein provided, but

which may be declared null and void upon breach of any of their terms.

"Unallotted lands, or portion thereof, within Indian reservations heretofore withheld from disposition under the mining laws may be declared by the Secretary of the Interior to be subject to exploration for the discovery of deposits of gold, silver, copper, and other valuable metalliferous minerals and nonmetalliferous minerals, not including oil and gas, by citizens of the United States, and after such declaration mining claims may be located by such citizens in the same manner as mining claims are located under the mining laws of the United States: *Provided*, That the locators of all such mining claims, or their heirs, successors, or assigns, shall have a preference right to apply to the Secretary of the Interior for a lease within one year after the date of the location of any mining claim, and any such locator who shall fail to apply for a lease within one year from the date of location shall forfeit all rights to such mining claim: *Provided further*, That duplicate copies of the location notice shall be filed within sixty days with the superintendent in charge of the reservation on which the mining claim is located and that application for a lease may be filed with such superintendent for transmission to the Secretary of the Interior: *And Provided further*, That lands containing springs, water holes, or other bodies of water needed or used by the Indians for watering live stock, irrigation, or water-power purposes shall not be designated by the Secretary of the Interior as subject to entry under this section."

IMPORTANT BILLS REVIEWED IN THIS ISSUE

Mining

H. R. 12393—Enacted Into Law. Mineral Leases.
H. R. 16168—Sinnott (Rep., Ore.). Copper Deposits.
S. 5035—Sheppard (Dem., Tex.). Potash Development.
H. R. 16052—Martin (Rep., Mass.). War Minerals.
S. 756—Pittman (Dem., Nev.). Silver Purchase.
S. 4177—Copeland (Dem., N. Y.). Coal Control.
S. 564—Reported by Committee. State Lands.
H. R. 15532—Garber (Rep., Okla.). Mineral Reservations.

Oil

S. 5243—Harreld (Rep., Okla.). Oil Operations.
S. 4893—Reported by Committee. Oil Leases.
S. 5029—Wheeler (Dem., Mont.). Oil Contests.
S. Res. 319—Wheeler (Dem., Mont.). Foreign Concessions.
H. Res. 373—McSwain (Dem., S. C.). Mexican Oil.

Labor

H. R. 12263—Passed by House. Labor Safety.

Taxation

H. Res. 343—Browning (Dem., Tex.). Excise Tax.
S. 5039—Couzens (Rep., Mich.). Tax Settlements.
H. R. 15549—Hale (Rep., N. H.). Corporation Taxes.
S. Res. 304—Passed by Senate. Stock Dividends.
S. Res. 317—Frazier (Rep., N. D.). Metal Inquiry.

Industrial

H. R. 9826—Swing (Rep., Cal.). Colorado River.
H. R. 15426—Garrett (Dem., Tenn.). Power Permits.
H. R. 16114—Bell (Dem., Ga.). Muscle Shoals.

Copper Deposits

H. R. 16168. Introduced by Mr. Sinnott (Rep., Oreg.), by request of the Interior Department. Referred to the Committee on Public Lands. This bill proposes to authorize patents to lands containing deposits of copper and associated minerals.

It provides as follows:

"That in the discretion of the Secretary of the Interior locations made under the lode mining laws of the United States upon unreserved public lands claimed to contain, at depth, copper and associated minerals, the actual existence of which can be demonstrated only through deep shafts or other deep underground workings, may be passed to patent upon evidence satisfactory to him of the mineral character of the land, without the requirement that applicants show an actual discovery of mineral upon or within the limits of their claim or claims: *Provided*, That not to exceed 640 acres of land may be located, held, applied for by, or patented to any one individual or corporation under the provisions of this act."

Potash Development

S. 5634. Introduced by Mr. Sheppard (Dem., Tex.). This bill amends the law covering Government potash explorations by simplifying the cooperative drilling contracts. In place of the former requirement, it provides as follows:

"The Secretary of the Interior and the Secretary of Commerce jointly are authorized, within their discretion, to cooperate under formal agreement with individuals, associations, corporations, states, municipalities, educational institutions, or other bodies, for the purposes of this act."

S. 5035. Introduced by Mr. Sheppard (Dem., Tex.). Referred to the Committee on Agriculture. This bill has the same end in view and provides in addition as follows:

"That before undertaking drilling operations upon any tract or tracts of land the Secretary of the Interior and the Secretary of Commerce jointly shall enter into a contract or contracts with the owners or lessees or both of the mineral rights therein and with the owners or lessees, or both, of the potash mineral rights within a radius of one mile of any proposed well, which contract shall provide, among other things, that not more than the actual cost of the exploration shall constitute a claim in favor of the United States and its cooperators against any minerals developed, and the aforesaid contract or contracts shall provide that the owners or lessees or both of mineral rights within a radius of one mile of any proposed hole shall pay to the Government and its cooperators a royalty of not less than 5 percent of the gross output of any potash minerals therefrom; said payments to continue until such time as the total amount derived from the sale of said 5 percent of the gross output is equal to not more than the cost of the exploration, as may be determined by the Secretary of the Interior and the Secretary of Commerce jointly: *Provided further*, That such contract shall not restrict the Secretary of the Interior and the Secretary of Commerce jointly in the choice of drilling locations within the property or in the conduct of the exploratory operations, so long as such selections or conduct do not interfere unreasonably with the use of the surface of the land or with the improvements thereon, and such contract shall provide that the United States and its cooperators shall not be liable for damages on account of such reasonable use of the surface as may be necessary in the proper conduct of the work."

H. R. 15827. Introduced by Mr. Hudspeth (Dem., Tex.). Referred to the Committee on Mines and Mining. This is similar to the foregoing except that it provides in addition as follows:

"That before such drilling be commenced the Secretary of the Interior and the Secretary of Commerce jointly shall require the owners of land and/or mineral rights therein lying within a radius of not less than one mile of any proposed well, in consideration of the probable increase in value to such lands and/or mineral rights therein incident to any discovery of potash and in order to prevent profiteering, to enter into an agreement whereby the Secretary of the Interior and the Secretary of Commerce, jointly, are empowered to act as referees in determining the maximum price at which the potash rights in such lands can be sold, which covenant shall run with the lands and/or mineral rights therein: *And provided further*, That the owners of such potash rights, in consideration of the advantage accruing from an equitable price for such potash rights as effected by said Secretary of the Interior and Secretary of Commerce, may be required to enter into an agreement whereby the potash produced from said lands shall be marketed at a price not in excess of a maximum determined by the Secretary of the Interior and the Secretary of Commerce jointly as equitable."

Helium Development

H. R. 15344. Introduced by Mr. Frothingham (Rep., Mass.). Reported by the Committee on Military Affairs.

This bill amends the helium production law by authorizing the sale of not more than 5,000 cubic feet of helium per year to aid in scientific and commercial development. It also provides for administration of this act by the Department of Commerce, with which the Bureau of Mines is now connected, as the original act of 1925 placed this authority in the Interior Department, with which the Bureau of Mines was then connected.

S. 5069. Introduced by Mr. Wadsworth (Rep., N. Y.). Referred to the Committee on Military Affairs. This bill is similar to the foregoing.

War Minerals

H. R. 16052. Introduced by Mr. Martin (Rep., Mass.). Referred to the Committee on Claims. This bill proposes to pay $800,000 to the United Chemical and Industrial Companies for losses in producing or preparing to produce manganese at the request of the Interior Department during the war.

H. R. 16053. Introduced by Mr. Martin (Rep., Mass.). Referred to the Committee on Claims. This bill proposes to pay $507,000 to the Crimora Manganese Corporation of Virginia for the same purpose.

H. R. 16241. Introduced by Mr. Luce (Rep., Mass.). Referred to the Committee on Claims. This bill proposes to pay $223,116 to Manganese Associates of Massachusetts for the same purpose.

Silver Purchase

S. 756. Introduced by Mr. Pittman (Dem., Nev.). Passed by the Senate and reported by the House Committee on Banking and Currency. This bill directs the Treasury to purchase at $1 per ounce 14,589,730 ounces of silver to complete purchases under the Pittman Act. It covers Pittman Act silver allocated for subsidiary coinage, but which was subsequently revoked and not replaced by Pittman Act silver.

Coal Control

S. 4177. Substitute for introduced by Mr. Copeland (Dem., N. Y.). This is a re-draft of the proposed coal control bill and provides as follows:

That the Bureau of Mines shall gather, analyze, and make public reports upon conditions of production, distribution, and storage of coal, including prices, marketing, wages, working conditions, trade and labor agreements, and practices affecting the operation of the coal industry and appropriate for consideration in the determination of a sound public policy in regard to said industry.

The bureau may require any person having information, the knowledge of which is necessary for the performance of the duties imposed upon the bureau, to furnish such information in the form of such statements or reports, in writing or otherwise, as the director of the bureau may request.

It shall be the duty of all employers and employes engaged in the coal industry to exert every reasonable effort to make and maintain agreements concerning wages and working conditions, and to settle all disputes in the making of, or application of, agreements, in order to prevent unreasonable restraints upon or interruptions of interstate commerce.

In the event that a dispute between employers and employees is not settled through such machinery of contact and adjustment as they may mutually establish, the President is authorized to employ such officers, agents, or agencies as may exist or as he may create suitable for that purpose to mediate in such dispute, and if unable to bring the parties into agreement, to endeavor to induce them to submit the controversy by voluntary agreement to the decision of arbitrators.

In the event that any dispute or disputes not settled in the manner heretofore provided shall threaten substantially to restrain or to interrupt interstate commerce, the President is authorized and empowered to create an emergency coal board. The board shall investigate and report to the President upon the controversy within 30 days of the date of its creation and shall report specifically as to whether, if the controversy in question remains unsettled, the result will be to deprive the public of an adequate supply of coal, or otherwise substantially to restrain or interrupt interstate commerce.

In the event that there is imminent danger that the public may be deprived of an adequate supply of coal, or that there will be a substantial restraint or interruption of interstate commerce in coal, or through an inadequate supply of coal, of which the President shall be informed through the report of the Emergency Coal Board, or otherwise, the President is authorized and empowered to proclaim that an emergency exists, threatening to impair the health, safety, and welfare of the people of the United States, and to interfere with commerce between the several states, and the President is hereby empowered and authorized:

To declare as operative and in full effect the provisions of the act approved September 22, 1922, granting additional powers to the Interstate Commerce Commission, providing for the appointment of a Federal fuel distributor, for the declaration of car-service priorities during the emergency, and to prevent the sale of fuel at unjust and unreasonably high prices. The authority to declare an emergency shall continue and remain within the discretion of the President, unless otherwise provided by Congress.

That if any clause, sentence, paragraph, or part of this act shall be adjudged by any court to be invalid, such judgment shall not affect, impair, or invalidate the remainder of the act, but shall be confined in its operation to the clause, sentence, paragraph, or part directly involved in the controversy in which such judgment has been rendered.

H. R. 14684. Introduced by Mr. Parker (Rep., N. Y.). Defeated in the House Committee on Interstate Commerce, January 13, by a vote of 6 to 16.

Coal Lands

H. R. 16218. Introduced by Mr. Hardy (Rep., Colo.). Referred to the Committee on Public Lands. This bill proposes that the Government shall exchange land in Delta County, Colo., for land of the Juanita Coal and Coke Co., in Gunnison County, Colo., in order to consolidate Government holdings of coal lands.

Mineral Lands

H. R. 15016. Reported by the House Committee on Public Buildings and Grounds. This bill authorizes the Government to allow the owner of land proposed for a site for a public building at Tamaqua, Pa., to reserve the mineral contents.

H. R. 15018. Reported by the House Committee on Public Lands. This bill validates the mineral entry of the Pacific Portland Cement Co. for the Empire mill site in the Carson City, Nev., land district, and the mineral placer entry of the Placer Gold Dredging Co., on Cleary Creek, in the Fairbanks, Alaska, district.

H. R. 16112. Introduced by Mr. Sinnott (Rep., Oreg.). Referred to the Committee on Public Lands. This bill grants to the states the minerals in their school land grants, the states to lease the lands. It provides:

"That, subject to the provisions of subsection (a), (b), and (c) of this section, the several grants to the states of numbered sections in place for the support or in aid of common or public schools be, and they are hereby, extended to embrace numbered school sections, mineral in character, unless land has been granted to and/or collected by and certified or approved to any such state or states as indemnity or in lieu of any land so granted by numbered sections.

"(a) That the grant of numbered mineral sections under this act shall be of the same effect as prior grants for the numbered nonmineral sections, and titles to such numbered mineral sections shall vest in the states at the time and in the manner and be subject to all the rights of adverse parties recognized by existing law in the grants or numbered nonmineral sections.

"(b) That the additional grant made by this act is upon the express condition that all sales, grants, deeds, or patents for any of the lands so granted shall be subject to and contain a reservation to the state of all the coal and other minerals in the lands so sold, granted, deeded, or patented, together with the right to prospect for, mine, and remove the same. The coal and other mineral deposits in such lands shall be subject to lease by the state as the state legislature may direct, the proceeds of rentals and royalties therefrom to be utilized for the support or in aid of the common or public schools: *Provided*, That any lands or minerals disposed of contrary to the provisions of this act shall be forfeited to the United States by appropriate proceedings instituted by the Attorney General for that purpose in the United States district court for the district in which the property or some part thereof is located.

"(c) That any lands included within the limits of existing reservations of or by the United States, or specifically re-

served for water-power purposes, or included in any pending suit or proceeding in the courts of the United States, or subject to or included in any valid application, claim, or right initiated or held under any of the existing laws of the United States, unless or until such application, claim, or right is relinquished or canceled, and all lands in the Territory of Alaska, are excluded from the provisions of this act.

"That nothing herein contained is intended or shall be held or construed to increase, diminish, or affect the rights of states under grants other than for the support of common or public schools by numbered school sections in place, and this act shall not apply to indemnity or lieu selections or exchanges or the right hereafter to select indemnity for numbered school sections in place lost to the state under the provisions of this or other acts, and all existing laws governing such grants and indemnity or lieu selections and exchanges are hereby continued in full force and effect."

S. 564. Recommitted to the House Public Lands Committee, and later again reported to the House. This bill is similar to the foregoing.

H. R. 16111. Introduced by Mr. Sinnott (Rep., Oreg.), by request of the Interior Department. Referred to the Committee on Public Lands. This bill would withhold timberlands from sale under the timber and stone act in California, Oregon, Nevada and Washington.

H. R. 16108. Introduced by Mr. Sinnott (Rep., Oreg.), by request of the Interior Department. Referred to the Committee on Public Lands. This bill proposes to repeal the stock-raising homestead act, in the administration of which complaint has been made that it has interfered with mining rights.

H. R. 16109. Introduced by Mr. Sinnott (Rep., Oreg.), by request of the Interior Department. Referred to the Committee on Public Lands. This bill proposes to repeal the law for the sale of desert lands.

Mineral Reservations

H. R. 15532. Introduced by Mr. Garber (Rep., Okla.). Referred to the Committee on Public Lands. This bill amends the stock raising homestead act by eliminating the section which reserves to the Government the coal and other minerals in the land, together with the right to prospect for, mine and remove the same.

S. 5206. Introduced by Mr. Phipps (Rep., Colo.). Referred to the Committee on Agriculture. This bill establishes grazing districts on public lands, but provides that their use for grazing shall not interfere with mining rights to the lands.

S. 3963. Transferred from the Committee on Agriculture to the Committee on Public Lands. This bill provides for grazing on public lands in Alaska, but subordinates such use to the development of the mineral resources of the lands.

Alaskan Entries

H. R. 15650. Introduced by Mr. Sutherland (Rep., Alaska.). Referred to the Committee on Public Lands. This bill proposes to authorize the purchase of five acre tracts of unreserved public lands in Alaska at $2.50 per acre as homesteads or headquarters by any citizen of the United States employed by citizens of the United States, associations of such citizens or by corporations organized under Federal or state law, whose employer is engaged in trade, manufacture or other productive industry, and by any citizen of the United States who is so engaged.

Oil Operations

S. 5243. Introduced by Mr. Harreld (Rep., Okla.). Referred to the Committee on Indian Affairs. This bill proposes to compensate land owners for damages by oil and gas mining operations on the Osage Indian Reservation in Oklahoma. It provides:

"The bona fide owner, lessee, or occupant of the surface of lands in the Osage Nation in Oklahoma shall be compensated, as his interest may appear, and under rules and regulations to be prescribed by the Secretary of the Interior, for damages to crops and improvements occasioned by the oil or gas lessees, their servants, or agents in going upon such premises and in carrying oil or gas mining operations. Such surface owner, lessee or occupant shall also be compensated, as his interest may appear, and under rules and regulations to be prescribed by the Secretary of the Interior, for such other damages, including those arising out of pollution of ponds or streams and out of injuries to the surface of lands, as are caused by the negligence of the oil or gas lessees, their servants, or agents in developing or operating oil or gas properties in said Osage Nation. All claims for damages arising under this section shall be settled by arbitration; but either party shall have the right to appeal to the courts, without consent of the Secretary of the Interior, in the event he is dissatisfied with the award to or against him. The award shall be in writing and shall be filed in the office of the Superintendent of the Osage Indian Agency within ten days after it is made, and thereupon the said superintendent shall give the parties written notice thereof by personal service or registered mail. Unless appealed from within 60 days after service or mailing of said notice, the award shall become final. The appeal herein authorized shall consist of filing an original action in the United States district court for the district in which Osage County is or may hereafter be situated, to enlarge, modify, or set aside the award; and in any such action, upon demand of either party, the issues both of law and of fact shall be tried de novo. Arbitration or a bona fide offer in writing to arbitrate shall constitute condition precedent to the right to sue for such damages, and the United States district court shall have exclusive original jurisdiction in such causes."

H. R. 16074. Introduced by Mr. Montgomery (Rep., Okla.). Referred to the Committee on Indian Affairs. This is similar to the foregoing.

Oil Leases

S. 4893. Reported by the Senate Committee on Indian Affairs. This bill authorizes oil and gas mining leases on unallotted lands in executve order Indian reservations.

Oil Contests

S. 5029. Introduced by Mr. Wheeler (Dem., Mont.). Referred to the Committee on Public Lands. This bill authorizes contests for oil and gas permits and provides as follows:

"That if any person qualified to receive an oil and gas prospecting permit under the act entitled 'An act to promote the mining of coal, phosphate, oil, oil shale, gas, and sodium on the public domain' approved February 25, 1920, as amended and extended, contests an oil and gas prospecting permit and procures a cancellation of such permit, the contestant shall be notified of such cancellation by the Secretary of the Interior and shall, during the period of thirty days from the date of such notice, be entitled to a preference right over others to an oil and gas prospecting permit for the lands included in such canceled permit.

"If any person who has initiated a contest dies before the termination thereof, such contest shall not abate but the heirs of such person who are citizens of the United States may continue the prosecution of such contest under such rules and regulation as the Secretary of the Interior may prescribe, and such heirs shall be entitled to the same rights under this act that the contestant would have been entitled to if his death had not occurred."

Foreign Concessions

S. Res. 319. Introduced by Mr. Wheeler (Dem., Mont.). Referred to the Committee on Foreign Relations. This bill directs the committee to investigate American investments abroad which are "alleged in a number of instances to be conditioned upon unjustifiable concessions from foreign governments."

S. Res. 306. Introduced by Mr. King (Dem., Utah). Referred to the Committee on Foreign Relations. This resolution proposes an investigation by that committee of the action of the State Department in connection with the Chester oil concessions in Mosul and Armenia, in which is mentioned the Standard Oil Co.

Mexican Oil

H. Res. 373. Introduced by Mr. McSwain (Dem., S. C.). Referred to the Committee on Foreign Affairs. This resolution calls on the State Department for information as to property rights of Americans affected by the new oil law of Mexico requiring 50-year concessions.

H. Res. 371. Introduced by Mr. Moore (Dem., Va.). Referred to the Committee on Rules. This resolution directs the Foreign Affairs Committee to ascertain

to what extent English and other companies have accepted the new laws of Mexico relative to oil rights and concessions, and whether the American Government advised or suggested Americans to accept or decline to comply with such laws.

H. Res. 368. Introduced by Mr. Huddleston (Dem., Ala.). Referred to the Committee on Foreign Affairs. This resolution declares that the American Government has no right to interfere in the internal affairs of Mexico nor to attempt to influence Mexico in its decisions upon such affairs which do not affect the safety of persons or property of Americans.

Oil Lease

H. R. 15812. Introduced by Mr. Winter (Rep., Wyo.). Referred to the Committee on Public Lands. This bill cancels oil and gas prospecting leases to the Kentucky-Wyoming Oil Co. in the Cheyenne, Wyo., land district on the ground that they were prematurely issued. The bill relieves the company from payments under the leases, it being stated that it has expended $100,000 in exploration, and paid the Government $5,000 rental, but has received no returns from the lease.

Oil Claim

H. R. 16027. Introduced by Mr. Bacharach (Rep., N. J.). Referred to the Committee on Claims. This bill authorizes the Court of Claims to hear a case involving alleged erroneous collection of $60,283 tonnage taxes in 1920 and 1921 on vessels of the Standard Oil Co. of New Jersey.

Labor Safety

H. R. 12263. Passed by the House. This bill creates a division of safety and establishes a safety museum in the Bureau of Labor Statistics of the Department of Labor. It provides as follows:

"That there is created in the Bureau of Labor Statistics of the Department of Labor a Division of Safety with a chief of division, an assistant chief, and such experts, special agents, clerks and other employes as may be authorized from time to time by appropriation. It shall be the duty of such division, under the direction of the Commissioner of Labor Statistics, to collect statistics of industrial accidents in all lines of employment, to collate and analyze such statistics with special reference to their causes, effects, and occupational distribution; to make general and special studies and investigations of labor safety plans and devices of various kinds, and of their need and adaptation as relates to different classes of machinery, processes of production, and undertakings of whatever nature in which labor is employed; to study all phases of the subject of occupational hazards and their prevention and to make public the results of such investigations, examinations, and studies from time to time.

"All the duties above prescribed may be undertaken either directly through or in cooperation with other offices, bureaus, and agencies of the Government of the United States, or through or in cooperation with the departments or bureaus of labor, industrial commissions, and like agencies of the states and territories, in so far as such cooperation can be effected, to the end that uniformity in reporting may be attained and duplication of work avoided.

"So far as appropriations for such purpose may be available, there shall be provided a museum of sufficient size and capacity in which shall be exhibited approved devices for the safeguarding of machinery, the protection of employes from injury, the lessening of dangerous conditions which may exist in any industrial enterprise, and the methods of lessening, preventing, and controlling industrial diseases. All such appliances, devices, and arrangements may be exhibited at rest or in motion as may best serve the purposes of such exhibit: *Provided*, That the Department of Labor shall not conduct any of the inquiries, examinations, investigations, or studies specified in this act, where such inquiries, examinations, investigations, or studies are now being conducted or are authorized to be conducted by other Federal agencies."

Excise Tax

H. Res. 343 and 347. Introduced by Mr. Browning (Dem., Tenn.). Referred to the Committee on Rules. These resolutions propose that the Committee on Agriculture provide as a substitute for an equalization fee on farm products an excise tax against products under the present tariff law, such as steel, aluminum and others receiving benefits by the tariff, the tax to be imposed in proportion to the benefits received from the tariff.

Tax Settlements

S. 5039. Introduced by Mr. Couzens (Rep., Mich.). Referred to the Committee on Finance. This bill proposes to transfer the audit and settlement of internal revenue tax and customs duty cases from the Internal Revenue Bureau and Customs Division of the Treasury Department to the Comptroller General, under the supervision of an assistant to the Comptroller. The personnel of these organizations are likewise transferred. The duties of revenue and customs collectors are confined to the collection of taxes and customs duties, their accounts to be filed with the Comptroller General

Corporation Taxes

H. R. 15549. Introduced by Mr. Hale (Rep., N. H.). Referred to the Committee on Interstate Commerce. This bill defines the powers of the states to tax corporations engaged in interstate commerce, and provides as follows:

"That the legislature of each state may determine and direct, subject to the provisions of this section, the method of taxing corporations engaged either exclusively or partially in interstate or/and foreign commerce and having a usual place of business in the taxing state. The several states may tax the property of the income or both the property and the income of such corporations and may tax such corporations for the privilege of doing business provided the following conditions are complied with:

"No tax shall be laid upon property except such as is either situated or employed within the jurisdiction of the taxing state.

"No tax shall be laid upon income except such as is derived from property within or business carried on within the jurisdiction of the taxing state; but the fact that such income flows in whole or in part from interstate or foreign commerce shall not prevent the laying of the tax.

"No tax shall be laid which discriminates against corporations engaged either wholly or in part in interstate or foreign commerce.

"No tax for the privilege of doing business shall be laid against a corporation engaged within the taxing state solely in interstate or foreign commerce except an excise measured by property such as is described in paragraph a or by income such as is described in paragraph b or an excise measured in part by such property and in part by such income.

"No provision of this act shall be construed to limit or restrict the powers heretofore residing in the several states to tax corporations or the property or income thereof, nor to affect any act of Congress relative to the taxation of corporations by the Federal Government."

Stock Dividends

S. Res. 304. Introduced by Mr. Norris (Rep., Neb.). Adopted by the Senate. This resolution directs the Federal Trade Commission to report the names and the capital of corporations which have issued stock dividends and their amount since the decision of the Supreme Court which held that stock dividends are not taxable, and the same information prior to that decision. The resolution states that it is the practice of corporations to protect their stockholders from income tax by issuing stock dividends. This practice is also alleged to enable corporations to acquire competing plants and to evade the anti-trust law. The report of the commission is desired to enable the Senate to legislate upon the subject.

Metal Inquiry

S. Res. 317. Introduced by Mr. Frazier (Rep., N. D.). Referred to the Committee on Labor. This resolution points out that the report of the Commissioner of Internal Revenue shows that in 1924 corporations manufacturing metal and metal products who reported "no net income" paid $23,912,237 in cash dividends and $3,987,346 in stock dividends, and that there is a high protective tariff duty on most metals and metal products. It says that no investigation of the costs of production, capitalization, efficiency, wage paid, and business methods of most of these corporations has been made by a government agency for many years, if at all. The resolution directs the Tariff Commission to investigate the costs

of production, capitalization, efficiency, wages paid, business methods, and profits or losses of typical corporations manufacturing metal and metal products, including an equal number of those showing large profits, and those claiming in 1924 "no net income," and to report its findings to the Senate not later than December 1.

Colorado River

H. R. 9826. Introduced by Mr. Swing (Rep., Calif.). Reported by the Committee on Irrigation. This bill provides for power development on the lower Colorado River basin in connection with irrigation and flood control. It authorizes the construction at a cost of $125,000,000 of a dam 550 feet high at Boulder or Black Canyon and the construction of power plants to utilize the 26,000,000 acre feet of water created at the dam. Construction of the power plants is optional with the Interior Department which may instead lease the water power. It is estimated that 550,000 firm or constant horsepower will be available or a million horsepower on a 55 percent load factor.

Power Permits

H. R. 15426. Introduced by Mr. Garrett (Dem., Tenn.). Referred to the Committee on Interstate Commerce. This bill provides that the Federal water power act shall not be interpreted to authorize the Federal Power Commission to grant permits or to authorize the survey of banks, shores or soils of nonnavigable streams for the purpose of constructing dams and reservoirs on such streams, otherwise than upon the public lands of the United States, or to grant licenses to construct dams, reservoirs, or other improvements, to develop water powers and use the banks, soils, and waters of said stream for private purposes and in any way violate the sovereignty and property rights of the state within which the stream is situated and the right of riparian proprietors. The jurisdiction and power of the Federal Power Commission and other commissions, agencies, officers, and agents of the United States to authorize the construction of dams in and upon streams and develop the water powers of streams, shall be confined to navigable streams, other than on the public lands, and navigable streams upon which Congress has the power to regulate commerce and improve for navigation and transportation of commerce, which are defined and declared to be streams and waters that are navigable in fact and used or are susceptible of being used in their ordinary condition for navigation and as highways for commerce.

Muscle Shoals

H. R. 16114. Introduced by Mr. Bell (Dem., Ga.). Referred to the Committee on Military Affairs. This bill appropriates $150,000,000 for the manufacture at Muscle Shoals and sale by the Government to farmers at cost of ammonium phosphate or other high grade fertilizer.

Waterway Service

S. 312. Introduced by Mr. Shipstead (F. L., Minn.). This resolution requests the President to negotiate with England for an agreement for the joint construction by the United States and Canada of a shipway from the Great Lakes to the Atlantic Ocean via the St. Lawrence River route as recommended by a commission of which Secretary of Commerce Hoover was a member.

S. J. Res. 140. Introduced by Mr. Fletcher (Dem., Fla.). Referred to the Committee on Commerce. This resolution provides that the Shipping Board shall continue to indefinitely own and operate merchant vessels in the overseas trade.

H. R. 11616. Amendment to, introduced by Mr. McKellar (Dem., Tenn.). This amendment, which was defeated, proposed that locks and dams 9 and 17 on the Cumberland River above Nashville be eliminated and that there be substitute a combined river and power system operated by the Government.

Machine Parts

H. R. 15473. Introduced by Mr. Bacon (Rep., N. Y.). Referred to the Committee on Ways and Means. This bill provides that foreign-made parts for use on American-made machines shall not be exempt from tariff duty.

Patent Appeals

H. R. 16222. Introduced by Mr. Vestal (Rep., Ind.). Referred to the Judiciary Committee. This bill changes the title of the United States Court of Customs Appeals to that of the United States Court of Patent and Customs Appeals. Appeals from the Commissioner of Patents now considered by the Court of Appeals of the District of Columbia would hereafter go to the Court of Patent and Custom Appeals.

Military Surveys

H. R. 15662. Introduced by Mr. Furlow (Rep., Minn.). Reported by the Committee on Military Affairs. This bill provides that the War Department may obtain the assistance of the Geological Survey in making topographic surveys for military purposes.

Photograph of the Mill of the Miami Copper Company Taken at Night

METALS

PRACTICAL OPERATING MEN'S DEPARTMENT

GUY N. BJORGE, Editor

Practical Operating Problems of the Metal Mining Industry

EVOLUTION OF MILLING METHODS AT THE UTAH-APEX MINE, BINGHAM, UTAH, 1909 TO 1926

By ERNEST GAYFORD *

THE Utah-Apex Mining Co., operating in Carr Fork Gulch, Bingham Canyon, Utah, is one of the largest lead producers in the state; in 1925 it ranked second, with a production of 45,828,820 pounds. Its properties comprise 104 claims containing 1,112 acres of mineral-bearing ground, 790 acres of agricultural land, and a majority interest in 95 acres used for tailings storage.

The tonnage mined and the metal contents for the fiscal years ending August 31, 1925, and August 31, 1926, was as follows:

		1925
Ore mined	tons..	244,293
Metal content:		
Gold	ounces..	8,854
Silver	ounces..	906,189
Lead	pounds..	45,828,820
Copper	pounds..	3,989,081
Zinc	pounds..	19,384,081
		1926
Ore mined	tons..	201,945
Metal content:		
Gold	ounces..	9,706
Silver	ounces..	822,737
Lead	pounds..	33,310,657
Copper	pounds..	5,706,995
Zinc	pounds..	15,377,216

The total dividends distributed to stockholders from October, 1915, to October 1, 1926, were approximately $3,000,000, the issued stock being represented by 525,000 shares, par value $5.

The ores of the Utah-Apex mine are a mixed sulphide of lead-zinc-iron and lead-copper-iron carrying low values in gold and silver. Part of the mine production has been direct smelting ore and part milling ore which is treated in the company's mill, located at the mine. Previous to 1925 the chief source of income to the company was from its direct shipping ores. Since that date, however, and with the advent of selective flotation the mill has become of major importance, and before the end of 1926 only selected ores of higher grade will be sent direct to the smelters.

In 1909, the Utah-Apex Mining Co. took over the properties of the Phoenix Mining Co., and the two companies were merged under one management and one name. Included in the property taken over from the Phoenix Mining Co. was a 75-ton jig and table concentrating mill, the acquisition of this property starting the milling operations proper of the Utah-Apex Co., although previous to this date some custom mill ore had been shipped to Colonel Wall's mill at Bingham.

As an example of the changing methods and improvements in milling that have taken place in less than 20 years, and as an object lesson of the capital to be expended by an up-to-date mining company to keep step with such changes, the mill of the Utah-Apex has been reconstructed four times, and in addition, four fundamental changes in the flow sheet, calling for heavy capital expenditure, have been made.

A rather remarkable fact, illustrating that present-day methods tend toward simplicity as well as efficiency, is that the 450-ton plant of 1925 stood on the original millsite of the 75-ton mill of the Phoenix Mining Co., and covers little more, if any, mill space than the 150 jig and table plant of 1913.

The chronological order of the various methods of milling and mill changes from 1909 to the latter part of 1926, are as follows:

Flow Sheet No. 1, 1909 (Aug.) 75-ton capacity plant taken over from the Phoenix Mining Co., rebuilt and converted into a 150-ton Hartz jig and table plant.

F. S. No. 2, 1913 The 1909 mill reconstructed into a 300-ton Woodbury jig, table and Vanner plant.

F. S. No. 3, 1915 Vanners removed and Janney flotation machines installed for treating segregated slimes and the necessary filter plant installed for flotation concentrates.

F. S. N. 4, 1922 Fagergren Flotation machines substituted for Janney machines.

F. S. No. 5, 1923 Mill converted into a fine grinding and Callow flotation plant, to make a bulk lead-iron concentrate; tables used on flotation tailings only (the use of these was later abandoned).

F. S. No. 6, 1925 (Aug.) Flotation methods altered to make a high grade selective lead concentrate dropping iron and zinc.

F. S. No. 7, 1925 (Nov.) Additional Callow flotation installed for selective flotation of lead and zinc and additional fine grinding capacity in-

* Vice-President and Secretary, General Engineering Co., Salt Lake City.

TABLE I—UTAH-APEX MINING CO., BINGHAM CANYON, UTAH
Milling Data

Year	Ratio of concentration	Heads: Silver	Heads: Lead	Heads: Insol.	Heads: Iron		Concentrates: Gold	Concentrates: Silver	Concentrates: Lead	Concentrates: Insol.	Concentrates: Zinc	Concentrates: Iron	Tails: Silver	Tails: Lead	Tails: Zinc
Flow Sheet No. 1															
1909	3.85-1	3.48	12.55	57.3	7.6		.0317	8.26	33.61	13.9	....	16.3		(‡)	
1910	4.20-1	3.61	12.72	55.0	7.0		.0229	8.70	36.53	12.83	....	15.9	1.5	3.8	....
1911 (July to Dec., incl.)	2.66-1	2.7	9.0	27.2	15.5		.065	5.71	16.5	6.9	7.22	26.9	1.8	2.8	....
1912	3.21-1	3.18	7.86	48.4	11.5		.0586	5.7	17.62	10.9	5.3	25.9	1.1	1.71	....
Jan., 1913, to Jan., 1914, incl.	3.37-1	3.12	10.26	52.58	8.94		.0443	6.74	27.97	....	....	....	.98	1.39	....
Flow Sheet No. 2															
May, 1914, to Nov., 1914, incl.	3.58-1	3.72	12.14	59.01	7.76		.0247	8.47	32.38	....	....	....	1.29	3.17	....
1915	3.27-1	2.96	9.30	55.77	9.69	Pb.	.0401	7.13	23.43	....	5.73	....	....	....	....
						Cu.	.0860	4.13	....	....	....	....	.99	2.01	....
Flow Sheet No. 3															
1916	3.24-1	3.30	8.69	51.2	11.3	Flot.	.0587	11.12	26.01	25.69	7.42	9.59	....	....	....
						Table	.0547	7.08	20.50	6.93	6.20	26.55	.95	1.07	....
1917	3.72-1	1.87	5.69	39.2	10.2	Flot.	.034	6.91	19.74	29.39	6.74	7.67	....	....	....
						Table	.0567	4.30	14.43	7.23	7.09	26.67	.58	.99	....
1918*	2.92-1	1.65	6.62	33.5	13.1	Flot.	.037	10.21	30.93	29.47	5.83	4.35	....	....	....
						Table	.0473	5.10	19.16	7.88	6.92	24.58	.89	.69	....
1919†	2.68-1	....	....	....	....	Flot.	.046	9.85	30.73	27.37	5.24	7.05	....	....	....
						Table	.061	5.38	16.85	10.29	6.55	24.56	....	....	....
1920	4.78-1	2.77	8.71	64.1	6.5	Flot.	.023	12.06	36.87	28.46	5.58	4.50	....	....	....
						Table	.0306	8.14	30.05	10.30	6.78	19.06	....	1.39	....
Flow Sheet No. 4															
1922	4.78-1	2.56	7.49	63.7	6.6	Flot.	.043	10.19	30.82	14.15	6.62	15.29	....	....	....
						Table	.047	5.68	12.56	7.67	6.39	29.69	.76	1.44	....
Flow Sheet No. 5															
1923	3.61-1	2.31	7.27	60.8	7.32		.0374	7.41	23.62	10.31	7.24	20.07	.33	.36	....
1924	2.91-1	2.36	7.85	50.41	10.43		.0417	6.14	19.23	11.71	6.14	23.29	.40	.40	....
Jan. 1 to Aug. 10, 1925	2.83-1	2.37	7.10	45.32	12.05		.063	5.93	17.41	9.62	4.49	26.99	.36	.29	....
Flow Sheet No. 6															
Aug. 10 to Nov. 10, 1925	6.66-1	2.93	8.49	30.55	15.72		.142	14.59	48.28	14.34	3.95	7.94	.90	.89	....
Flow Sheet No. 7															
Nov. 10, 1925 to March, 1926, (inclusive)															
Lead Feed	5.43-1	3.51	10.46	28.88	15.33		.102	15.47	51.45	10.03	5.91	7.22	.82	1.03	....
Zinc Feed	9.03-1	.82	.45	....	7.81	(Zinc)	.027	3.28	3.69	3.02	51.28	8.17	.61	.87	2.32

* Heads and Tails assays in 1918 incomplete—only two months shown. † No assays of heads or tails available for 1919—mill ran Jan. 1-19 and March 5-15 only. † No tails assay this year.

stalled to increase the mill capacity of 450 tons.

F. S. No. 8, 1926 (Nov.) An entirely new coarse crushing plant, installation of additional grinding mills, new filter plant and MacIntosh pneumatic cells installed to make a separate lead and copper concentrate from the lower level ores, giving the plant a capacity of 450 tons lead-zinc ores and 300 tons of lead-copper ores.

The 1913 (2), 1923 (5), 1925 (7) (November), and 1926 (8), flow sheets are illustrated herewith (Pages 131, 132 and 133). Flow Sheets No. 7 (lead-zinc unit) and No. 8 (lead-copper unit) with the new crushing plant, common to both, have been incorporated together and represent the mill flow sheet as it is today.

The ratio of concentration, mill heads, mill concentrates and mill tails for the various flow sheets (excepting No. 8) are shown in Table I. The mill report for the fiscal year ending August 31, 1926, is shown in Table II.

Milling Cost

The actual milling operating cost per ton for the years 1909 to 1926 (up to August 31) are as follows:-

Flow Sheet No. 1, 1909-1912 incl.	$0.88
Flow Sheet No. 2, 1913-1915 incl.	0.86
Flow Sheet No. 3, 1916-1920 incl.	1.69
Flow Sheet No. 4, 1922	2.35
Flow Sheet No. 5, 1923-Aug., 1925 incl.	1.46
Flow Sheet No. 6, Aug.-Nov., 1925 incl.	1.37
Flow Sheet No. 7, Nov., 1925-Aug., 1926 incl.	1.81
Flow Sheet No. 8, Aug.-Dec., 1926	*

* Not yet available.

TABLE II—UTAH-APEX MINING CO., BINGHAM CANYON, UTAH
Mill Report for Fiscal Year Ended August 31, 1926

			Tons
Tonnages:	Ore milled		111,613
	Concentrates: Lead	Tons 18,863	
	Zinc	8,256	
			27,119
	Tailings		84,494

Ratio of concentration—Lead 5.92 into 1
Ratio of concentration—Zinc 9.54 into 1 (on 78,800 tons zinc heads since Nov. 10)
Ratio of concentration—Zinc 11.39 into 1 (on 94,054 tons milled since Nov. 10)

Metal Content:	Gold—Oz.	Silver—Oz.	Lead—Lbs.	Copper—Lbs.	Zinc—Lbs.	Zinc—Lbs. Since Nov. 10
Heads	3,900.790	372,752	21,867,199	1,232,959	14,316,730	12,435,313
Lead concentrates	2,051.723	298,473	19,940,336	751,060	1,888,260	1,695,621
Zinc concentrates	213.222	19,639	355,720	232,562	8,312,673	8,312,673
Tailings	1,635.845	54,640	1,571,143	249,337	4,115,797	2,427,019

Recoveries:

Percent of Metals in:	Gold	Silver	Lead	Copper	Zinc
Lead concentrates	52.6	80.1	91.19	60.9	13.19
Zinc concentrates	5.5	5.3	1.63	18.9	66.35*

* Zinc cells recovered 77.4 percent of zinc heads.

Average Assays:

	Gold	Silver	Lead	Copper	Insol.	Zinc	Iron
Heads	.035	3.34	9.80	.55	28.80	6.41	15.57
Lead concentrates	.109	15.82	51.86	1.99	11.49	5.01	6.66
Zinc concentrates	.026	2.38	2.15	1.41	3.02	50.34	8.72
Tailings	.019	.65	1.15	.15	.....	6.05*	.....
						1.72†	

* Before Nov. 10, 1925. † Since Nov. 10, 1925.

Regular Operating Expenses:	Amount	Per ton milled
Labor	$55,382.62	$.496
Supplies	73,587.47	.659
Electric power	34,831.97	.312
Renewals	13,830.23	.124
Royalties	15,556.74	.139
Tailings pond	6,142.91	.055
Miscellaneous	2,969.53	.027
Total	$202,301.47	$1.812

These costs are not, of course, comparative since they are complicated by pre-war and post-war conditions. They are given, however, so that those familiar with such conditions can make their own comparisons.

The first attempt to make the zinc contents of the ore an asset was in September, 1916, when tests were made on table

middlings. The best zinc product obtained, however, assayed:

	Pct.
Lead	5.2
Zinc	39.23
Iron	14.75
Insol	2.77

with a 40.5 percent extraction of the zinc and was not a commercial proposition. Compare this with the zinc product assaying 50 to 54 percent zinc, 3 percent insoluble, 6.5 percent iron with an 80 percent to 85 percent extraction obtained at present by selective flotation.

Particular attention should be paid to the comparison of Flow Sheets No. 2 and No. 5 as it illustrates graphically the simplification in milling methods brought about by fine grinding and direct flotation as against step grinding and gravity concentration with its attending trommels, screens, elevators, etc. Interesting also is the comparison of mill results as follows:

FLOW SHEET NO. 2, 1913 to Nov., 1914

Heads

Ratio	Ag.	Pb.	Insol	Fe.
3.48	3.42	11.20	55.80	8.35

Concentrates

Au.	Ag.	Pb.	Cu.
0.0345	7.65	30.15	0.66

Tails

Ag.	Pb.	Fe.
1.13	2.28	3.30

FLOW SHEET NO. 5, 1923 TO AUG., 1925

Heads

Ratio	Ag.	Pb.	Insol	Fe.
3.12	2.31	7.40	52.17	10.26

Concentrates

Au.	Ag.	Pb.	Cu.	Insol	Zn.	Fe.
0.047	6.49	20.08	0.96	10.55	6.29	23.4

Tails

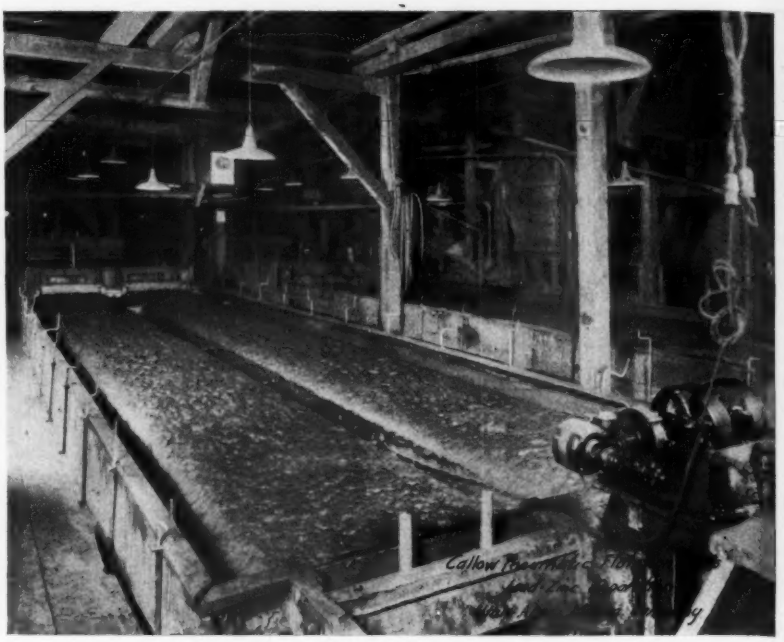
Ag.	Pb.	Cu.
0.36	0.35	....

The tailing loss by direct flotation being 0.77 ounce silver and 38.6 pounds of lead per ton less than by step grinding and gravity concentration, and while the actual milling cost of the latter shows as 91 cents per ton as against an average for the 3 years of $1.46, it will be noted that the 1923 cost was $1.93, but the 1925 cost had dropped to $1.13 per ton, also the 91 cents per ton cost of 1913 and 1914 are pre-war costs and, therefore, must be multiplied by the correct factor to make them comparative.

In August, 1925, the mill started to make a high grade selective lead concentrate, as against the bulk lead-iron concentrate, the comparison between the mill results of January to August, 1925 (bulk concentrates) and August to November, 1925 (selective lead concentrates) are as follows:

BULK CONCENTRATES

Ratio	Heads Ag.	Heads Pb.	Heads Insol	Heads Fe.	Concentrates Au.	Concentrates Ag.	Concentrates Pb.	Concentrates Cu.	Concentrates Insol	Concentrates Zn.	Concentrates Fe.	Tails Ag.	Tails Pb.
2.83-1	2.37	7.10	45.32	12.05	.063	5.93	17.41	1.07	9.62	4.49	26.99	0.36	0.29
SELECTIVE LEAD CONCENTRATES													
6.66-1	2.93	8.49	30.55	15.72	.142	14.59	48.28	1.63	14.34	3.95	7.94	0.90	0.89



Callow Pneumatic Flotation Cells, Lead-Zinc Separation, Utah-Apex Mining Co.

The higher tailing by selective flotation is accounted for in part by the fact that some of the silver is carried by the iron and some of the lead is very closely included with the pyrite.

The milling cost per ton by bulk flotation, was $1.129; by selective flotation, $1.374, the extra cost being due to the cost of the additional chemicals required for selective flotation. The production of a high grade lead concentrate showed a net smelter return of $2.35 per ton of crude ore in excess of the net return when using bulk flotation. Deducting from this the extra milling cost of 24 cents per ton, the actual extra returns per ton of crude ore are $2.11. It should be remembered that the Bingham mines are favorably situated with reference to the smelters; the freight rate on the bulk flotation concentrate being $1.30 per ton and on the high grade concentrate $1.70. Were the freight higher, as it would be in the case with many mines, the difference in favor of selective flotation would be greater.

The crushing for bulk flotation was to approximately 65 mesh, the reagents being:

1.35	lbs. per ton—Sodium sulphide
0.075	lbs. per ton—Cresylic acid
0.34	lbs. per ton—Xanthate
0.03	lbs. per ton—Thio Carbanilide.
0.02	lbs. per ton—Pine oil

For selective lead flotation the crushing was somewhat finer (about 5 percent on 80 mesh) and the average reagents were as follows:

0.01	lbs. per ton—Pine oil
2.80	lbs. per ton—Soda ash
0.10	lbs. per ton—Sodium Cyanide
0.35	lbs. per ton—Zinc sulphate
0.14	lbs. per ton—Xanthate

On November 9, 1925, the flotation installation had been completely remodeled to make both a selective lead and zinc concentrate and on November 10 the zinc section went into operation. The separation of lead from zinc was successful from the very beginning of operation. The first three shifts produced zinc concentrates assaying 46.5 percent zinc and the first four 55-ton car lots assayed 49.10 percent zinc.

The reagents finally adopted for the lead-zinc separation were approximately as follows, varying somewhat in quantities with the changes of the ore, etc.

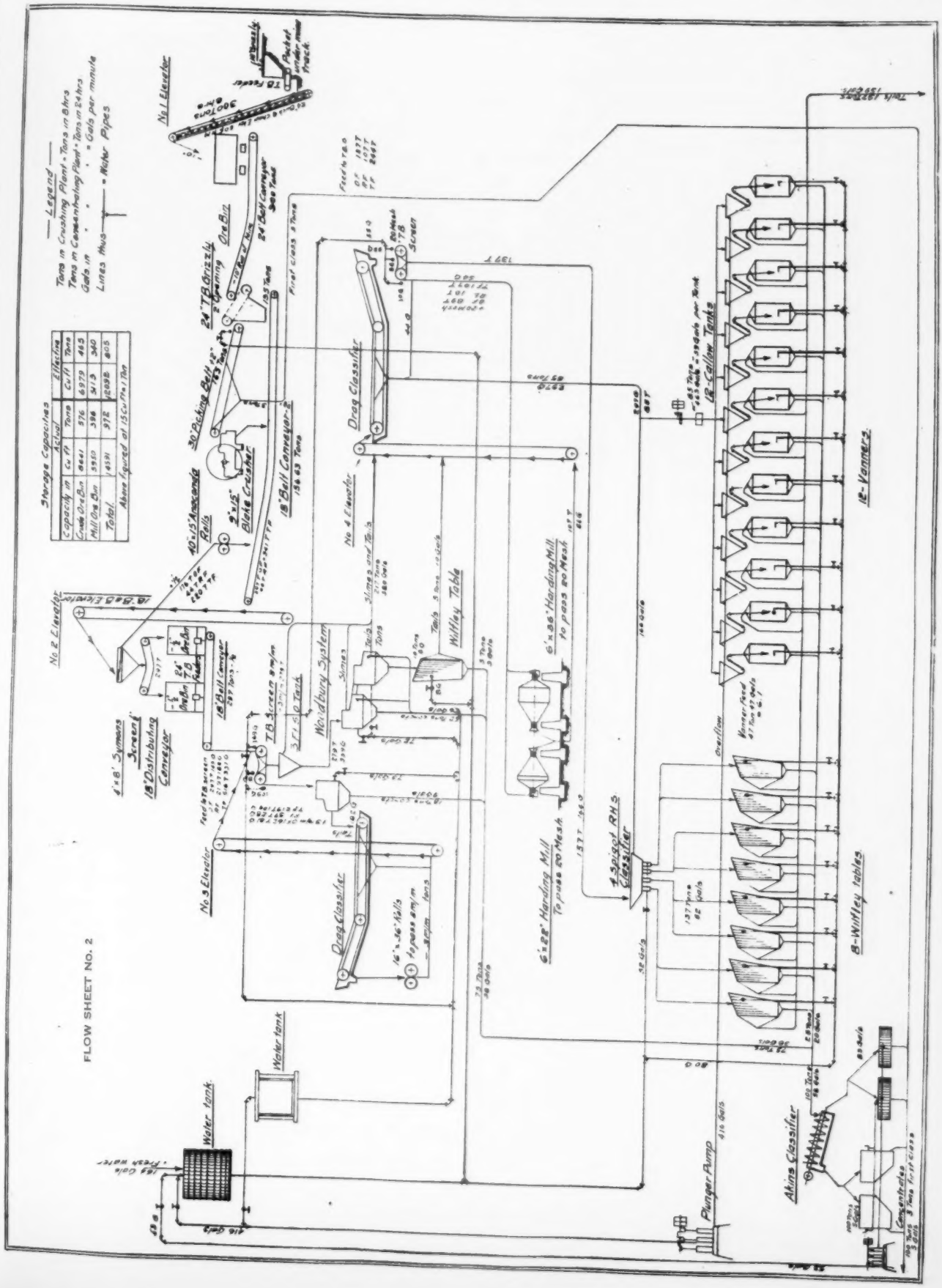
LEAD REAGENTS

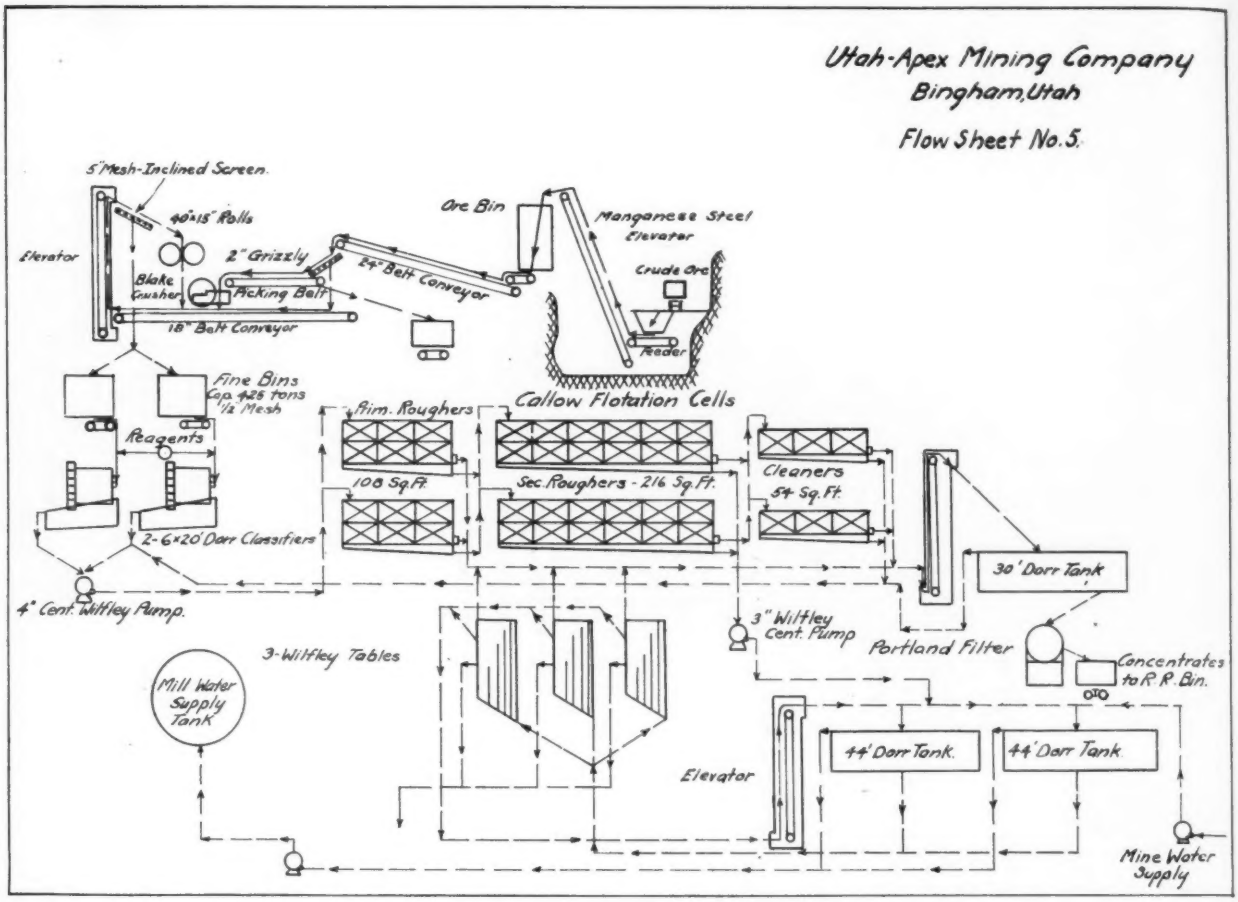
Soda ash	2 to 4	lbs. per ton
Sodium cyanide	0.1	lbs. per ton
Zinc sulphate	0.3	lbs. per ton
Xanthate	0.10	lbs. per ton
Thio carbanilide	0.06	lbs. per ton
Pine oil	0.05	lbs. per ton

ZINC REAGENTS (Added to Contact Tank)

Soda ash	1 to 2	lbs. per ton
Sodium cyanide	0.05	lbs. per ton
Zinc sulphate	0.15	lbs. per ton
Copper sulphate	1.0	lbs. per ton
Xanthate	0.05	lbs. per ton
T. A. mixture	0.10 to 0.20	lbs. per ton
Pine oil (G. N. S. No. 5).	0.05	lbs. per ton

The controlling reagent is the soda ash; the circuit must be kept alkaline for good results; frequent tests are made for this by the operators using phenol-phtalein as an indicator. The tailings are thickened in Dorr Tanks, the overflow from which is returned for re-use in the mill, as the main water supply comes


— Legend —
Tons in Crushing Plant - Tons in 8 hrs
Tons in Concentrating Plant - Tons in 24 hrs
Gals. in " " " = Gals per minute
Lines thus —— = Water Pipes
Storage Capacities
Actual
Effective
Capacity in Cu Ft Tons Cu Ft Tons
Crude Ore Bin 6641 376 6979 465
Mill Ore Bin 3550 198 5113 340
Total 10191 574 12092 805
Above figured at 15 Cu Ft per Ton
No 1 Elevator
24' T.B. Grizzly
24" Belt Conveyor
30' Picking Belt
10"x13" Ascenda Rolls
2-1/2" Blake Crusher
18' Belt Conveyor
No 4 Elevator
Drag Classifier
Wilfley Tables
6'x36' Harding Mill
No 2 Elevator
T.B. Screen
3 Flo-Tank
Weidburg System
4'x8' Symons Screen
18' Distributing Conveyor
No 3 Elevator
Drag Classifier
1 Spigot RH 5 Classifier
Water tank
Water tank
Plunger Pump
Akins Classifier
Concentrates
12-Cellow Tanks
12-Vanners
8-Wilfley tables
FLOW SHEET No. 2



from the mine and at times shows a distinctly acid reaction, the return water circuit naturally tends to materially reduce the quantity of soda ash required.

A 15-day period (December 31 to January 14, 1926) gave the following results:

Heads:	
Silver	3.2
Lead	9.6
Zinc	7.25
Iron	15.0
Lead Concts.:	
Lead	51.50
Insol	11.10
Zinc	4.90
Iron	7.60
Lead Tails:	
Silver	1.0
Lead	0.54
Zinc	6.9
Zinc Concts.:	
Lead	0.49
Insol	2.20
Zinc	49.2
Iron	8.48
Zinc Tails:	
Lead	0.37
Zinc	2.0
Lead recovery 95.37%.	
Zing recovery 74.02% (based on zinc feed).	

While the average zinc tailing is shown as 2 percent it fluctuated from a low of 1 percent to a high of 3 percent and at times it was difficult to produce a zinc concentrate close to 50 percent on account of the spasmodic tendency of the pyrite to float with the zinc.

It was then decided to try heating the zinc circuit to approximately 10° F. above the temperature of the lead circuit.

A typical 15 days' average (February 13 to 28, 1926) under this condition was as follows:

Heads:	
Silver	3.9
Lead	11.4
Zinc	8.40
Iron	16.00
Lead Concts.:	
Lead	50.6
Insol	12.30
Zinc	5.70
Iron	7.10
Lead Tails:	
Silver	0.97
Lead	0.97
Zinc	8.70
Zinc Concts.:	
Lead	1.60
Insol	3.15
Zinc	51.90
Iron	6.96
Zinc Tails:	
Lead	0.98
Zinc	1.20
Lead recovery 93.25%.	
Zinc recovery 88.28% (based on zinc feed).	

Heat, for a time appeared to materially benefit and steady the operation. In May, however, it was decided to substitute for the T. T. mixture (20 percent thio carbanilide dissolved in 80 percent ortho-toluidine) T. A. mixture (thioureas dissolved in aniline).

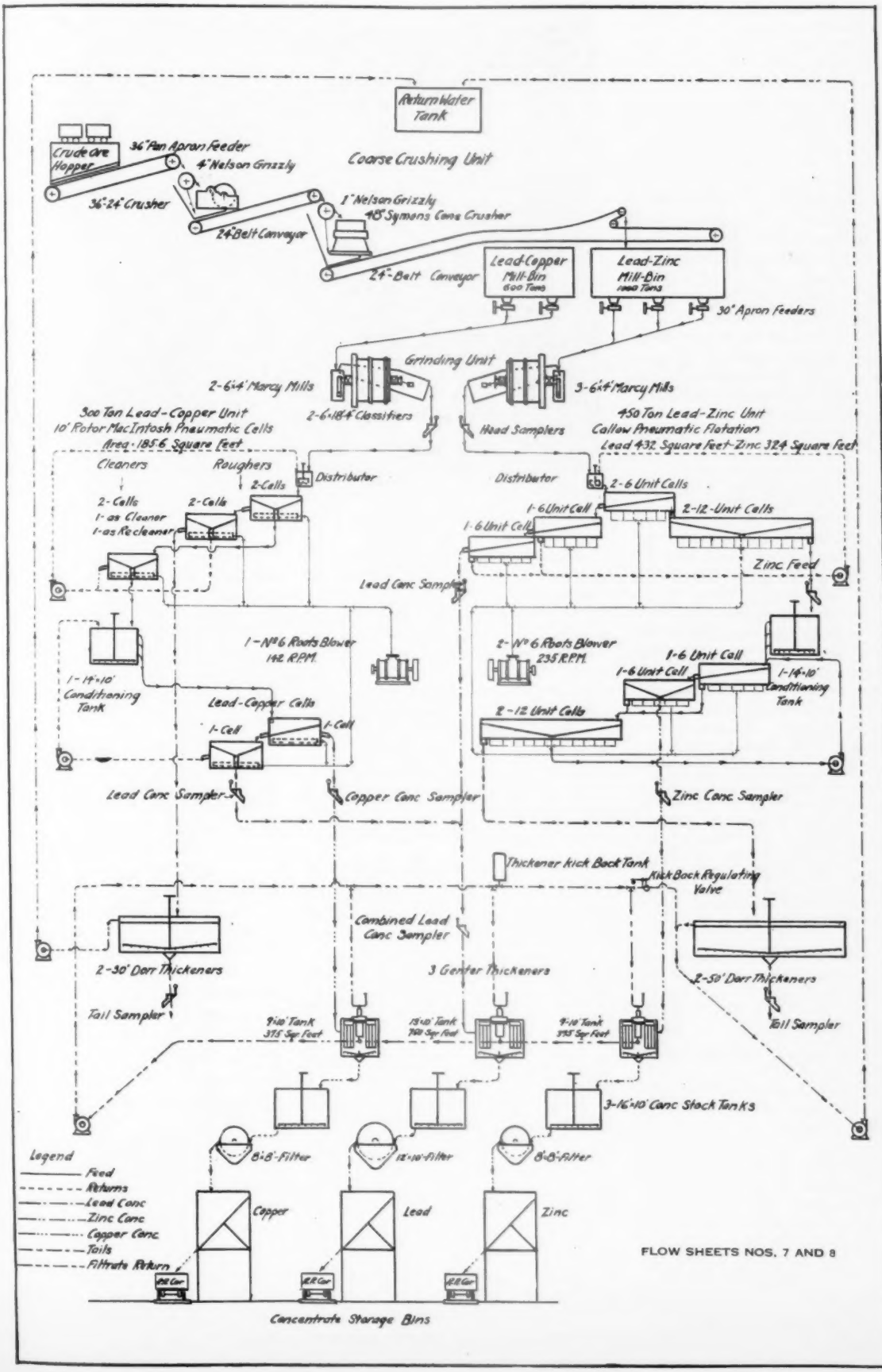
The principal reason for the substitution was that the T. A. reagent could be shipped as a mixture, whereas the ingredients making up T. T. mixture had to be shipped separately due to the thio crystalizing out at normal temperatures. The mixture also has to be kept at from 70 to 75° F. after being made up.

Shortly after starting to use the T. A. mixture it was decided to cut out the heat from the zinc feed for a time to get comparative results with and without heat when using this reagent.

It was found that when using T. A. reagent heat was of no material benefit and its use was abandoned, as the results with T. A. at normal temperature were equally as good as those with either T. T. or T. A. plus heat.

The normal capacity of the lead-zinc section of the mill is 450 tons per day—324 square feet of Callow cell area being used for the lead float and an equal area for the zinc float, the zinc concentrates being double cleaned. Later in the year additional cleaners were installed on the lead side, this increased the grade of the lead concentrates to 55 percent and occasionally higher.

The Utah-Apex ores contain a gangue, carrying silicate of alumina and magnesia in varying quantities; this has an annoying tendency to float with the lead.



FLOW SHEETS NOS. 7 AND 8

To a large extent this has so far baffled a continued effort to overcome it. When this is accomplished, as in all probability in time it will be, a 60 to 65 percent lead product may be expected.

An average mill cost up to August, 1926, for the selective flotation was $1.95 per ton (this has since been reduced to $1.45) and the production of a lead concentrate and a zinc concentrate showed a net smelter return of $5.25 per ton of crude ore in excess of the bulk flotation returns, as figured from the grade of ore and the metal prices prevailing at that time.

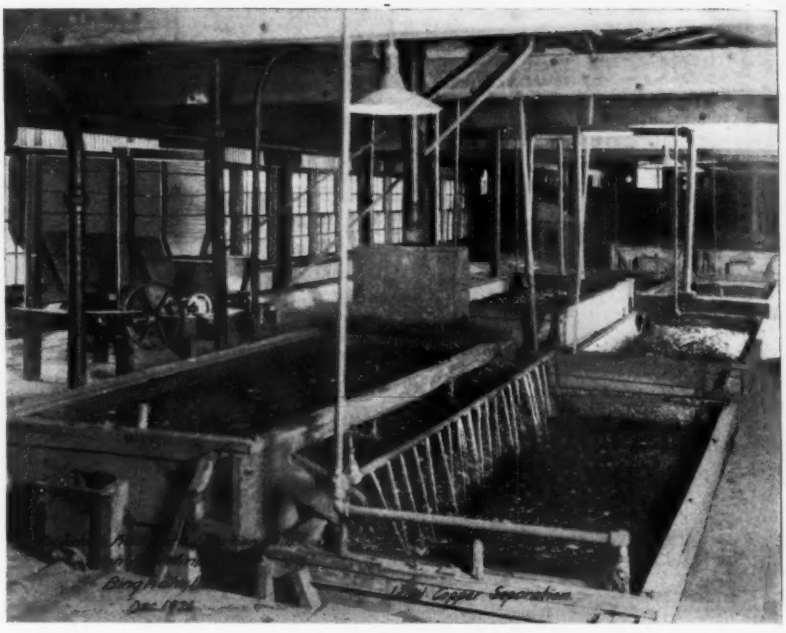
A gratifying fact is that the actual mill results have at all times been superior to the results of the somewhat exhaustive laboratory tests which were taken as the basis for changing the mill flow sheet from bulk flotation to selective flotation and that the returns from zinc concentrates reimbursed the company in less than two months for the expenditure necessary to make this product.

Lead-Copper

Early in 1926 the management realized that the development of the lead-copper ores in the mine would justify a lead-copper unit as an addition to the mill, should experimental work on this class of ore give results that would warrant the expenditure; and, also that the coarse crushing and filter plant would have to be enlarged and brought up-to-date to take care of the additional tonnage. Samples of the various grades of lead-copper ore were subjected to careful laboratory tests, the resulting products figured out against the smelter returns from shipping crude ore direct; and in April instructions were issued by the management to proceed with the design and construction of a 300-ton selective flotation lead-copper unit, an entirely new coarse crushing plant of a capacity of 120 tons per hour to three-fourths inch mesh and a new filter plant.

In the construction of the new plant belt conveyors and Wilfley sand pumps were used in all cases instead of elevators; pumps that were essential to steady operation being direct motor-driven and installed in duplicate. In the coarse crushing plant a 4-foot Symons Cone Crusher is used to reduce the ore to Ball Mill feed, instead of rolls; Nelson Grizzleys ahead of the 36-inch by 24-inch Jaw Crusher and the Symons Crusher instead of stationary grizzleys; the plant having a capacity of 120 tons per hour from mine run to pass a three-fourths inch ring.

The grinding (minus 80 mesh) for the lead-copper section is obtained in two 64½ Marcy Mills in closed circuit with classifiers. The flotation is obtained in MacIntosh Pneumatic Cells using air at the rate of 8 cubic feet per square foot of cell area at 2 to 3 pounds pressure.



MacIntosh Pneumatic Flotation Cells, Utah-Apex Mining Co., Bingham, Utah

At the present time for treating 300 tons per 24 hours, four roughers, one cleaner, and one recleaner, for the bulk flotation concentrate; one separatory cell and one cleaner for the final lead concentrate or a total of 186 square feet are in use.

The treatment developed in the experimental work for floating this ore was, to first float a bulk lead-copper concentrate, then re-treat this bulk concentrate as shown in Flow Sheet No. 8.

For the bulk flotation the density of the cell feed is kept at approximately 4 to 1, and the reagents used are as follows:

IN BALL MILLS (Per ton dry solids)	
Soda ash	0.40 to 1.10 lbs.
Sodium cyanide	0.06 lbs.
Xanthate	0.22 lbs.
Thio	0.17 lbs.
IN FLOTATION FEED PUMP	
Pine oil	0.15 lbs.

The rougher froth (bulk flotation) is double cleaned (see Flow Sheet). However, the concentrate sent to the separatory cells is high in insoluble, a large percentage of the insoluble being silicates of alumina and magnesia, and while it has been found possible to materially reduce this insoluble, so far, whenever this has been accomplished the tailings have increased in value so as to more than offset the advantage of a higher grade concentrate.

The bulk lead-copper concentrate is pumped to a 14-ft. by 10-ft. contact tank equipped with a slow moving agitator where it gets from 30 to 45 minutes contact with the following reagents:

Sodium cyanide 0.60 pounds per ton.

Lime 0.50 to 1 pound per ton.
the lime being regulated according to the titration of the pulp, alkalinity being kept at from 1.5 to 2.50 CCs $\frac{N}{10}$ H_2SO_4.

T. A. mixture at the rate of 0.15 pounds per ton in feed into the separatory cell.

The selective flotation of lead-copper ores is new, and as far as is known is not being attempted, commercially, anywhere else but in the Utah-Apex Mill. With the present knowledge, it is not as definite as lead-zinc separation, and is still in the development stage as far as ultimate results are concerned. The results being obtained at the present time in the Utah-Apex Mill fully justify the installation; in fact, average better than the results obtained in the test work, but will undoubtedly be improved upon as time goes on.

From the fact that the smelters pay from 65 to 70 percent of the market price for the copper in the lead concentrates, but do not pay for the lead in the copper concentrate, it is necessary to keep the lead as low as possible in the copper, even at a sacrifice of a larger percentage of copper in the lead. The mark set is, a lead concentrate carrying not to exceed 5 percent copper and a copper concentrate not to exceed 2.50 percent lead.

The lead-copper section went into complete operation early in November and the 10-day average results, November 11 to 20; 21 to 30 and December 1 to 10, were as follows:

Date	Heads		Lead Concts.		Copper Concts.		Tails	
	Pb. Pct.	Cu. Pct.	Pb. Pct.	Cu. Pct.	Pb. Pct.	Cu. Pct.	Pb. Pct.	Cu. Pct.
November 11 to 20....	5.06	2.42	43.84	5.92	4.36	21.06	0.957	0.488
November 21 to 30....	5.024	1.88	43.98	5.81	5.23	19.40	0.97	0.291
December 1 to 10....	5.18	2.95	37.70	6.66	3.75	21.32	1.096	0.632

The feed varies in the relation of lead to copper contents from day to day, which is inevitable with a mine of this type, the range being from 7.25 percent lead and 1.90 percent copper to 3.70 percent lead and 3.12 percent copper.

To make room in the main mill building for the additional equipment for the lead-copper unit, it was necessary to move the filter plant out of the mill and into a separate building.

The new filter plant is 500 feet from the mill building and the elevation of the thickeners in the filter plant is approximately 12 feet above the pump floor in the mill. The separate lead, copper and zinc concentrates are pumped with Wilfley pumps, as made, through 3-inch, 2-inch and 2½-inch pipe lines to Genter Vacuum Thickeners in the filter plant; one 750-square foot Genter in a 12-foot tank being used for the lead (100 to 120 tons per day) and two 375-square foot Genters in 9-foot tanks for the zinc (30 to 35 tons) and copper (20 to 25 tons).

The Genter discharge (60 to 65 percent solids) flows to concentrate storage tanks equipped with slow moving agitators where the thickened concentrates are stored for filtering; the clear filtrate is returned to the mill for re-use. The filters (Drum type) (one 11 feet 6 inches by 10 feet, and two 8 feet by 8 feet) operate a maximum of 8 hours per day.

The pipe lines carrying the concentrates to the filter plant are carried on trestles with a fall toward the plant of one-half an inch per foot. Some fear was expressed that with such dilute pulps and solids of high specific gravity, trouble might be experienced with the solids settling out in the pipe lines. This, however, has never happened and the whole scheme has worked out very satisfactorily.

The writer wishes to extend to R. F. Haffenreffer, Jr., President; V. S. Rood, Manager, and J. A. Norden, Acting Manager, his thanks for permission to publish this data and for the assistance they have been in furnishing to him the essential figures contained in this paper.

LOSS OF DIAMOND BITS

The loss or breakage of individual stones from the bit constitutes one of the most important losses in diamond drilling. A study of 48 drilling jobs in Minnesota, Michigan, Arizona, New Mexico, Colorado, Illinois, Wyoming, Indiana, Nebraska, Missouri, Wisconsin, Utah, North Dakota, Canada and China, which represent various kinds of drilling, shows that 24 percent of the total diamond loss, or 0.002 carat per foot, was due to breakage.

There are three causes for the loss of an individual diamond. The bit may be improperly set, without enough metal around the stone. The major part of the stone must be completely covered by metal and the stone must project only a small fraction of an inch from the face of the bit. If these two rules are not followed, a hard rock may obtain too much leverage on the stone and tear it from its setting. The same result may follow the use of a bit in which so much of the metal has been worn away from around the stones that they are no longer held in place securely. A third cause is the presence of small fragments of steel or hard pieces of rock, such as chert nodules, in the bottom of a hole which are particularly apt to tear the diamonds from their setting or to chip them. The danger of encountering pieces of steel is greatest in holes that have been drilled part way with a fishtail bit.

Lost stones are recovered in several ways. Bailing out the hole with a flat-bottom bailer, a suction bailer, or a sand pump is usually tried first. All the cuttings that are brought to the surface are saved. These bailings can be examined and the diamonds found if present. Where there is much caving material in the bottom of the hole, the circulation is reversed and a valve is provided at the bottom of the core barrel. All material will then be washed into the core barrel and the stone may be recovered. This plan avoids all danger of washing the stone into a crevice, as may occur if an attempt is made to flush out the hole with a high-pressure pump without reversal of circulation. If the hole is clean, holes about the size of the lost stone are bored in an old bit from which the stones have been removed, and filled with tar, rod dope, or some other sticky substance. This bit is then run into the hole as an impression block would be. If there are small pieces of rock or dirt at the bottom of the hole, a flat-pointed steel bit is sometimes used to grind away the stub of core and make the hole concave. The bottom of this concavity will be in the center of the hole and ordinarily the diamond will thus work into the center of the hole out of the way of the core bit. The rock is then cored, bringing up the stone on top of the core. Rotary motion of the flat-pointed bit will not injure the stone, as it will be carried around with the bit. Another method is to use a calyx so arranged that the material is washed up a few feet and falls into it. When this is used circulation is started several times for short periods only.

RECORD YEAR FOR OIL INDUSTRY

The American oil industry in 1926 had a record year in all departments. Domestic production of 768,500,000 barrels, with December partly estimated, contrasted with 763,743,000 barrels in 1925. Net imports of crude were 45,219,000 barrels, December estimated, making the total available supply of new oil at a new record total of 813,719,000 barrels. This was slightly more than the total new supply of 812,243,000 barrels in 1925, our net imports last year having been less than in 1925.

Demand for oil products progressed at a faster rate than new oil supply, with the result that there was a decrease of about 23,000,000 barrels last year in the above-ground storage of all kinds of oil. However, about 8,000,000 barrels of this decline was due to loss in the Union Oil fires. Actual deficiency in new supply last year was about 15,000,000 barrels.

Contrasted with 1925 net results, last year showed a more striking change. In 1925, with a smaller total of new oil supply, storage of all kinds of oil showed net gain of 32,425,000 barrels; in 1926 the new supply, excluding fire loss, failed by more than 15,000,000 barrels to match the demand.

Briefly put, the 1926 oil situation contrasted with that of 1925, may be shown in the following figures, all in barrels:

	1926		1925
Total new supply..	813,719,000		812,243,000
Change in stocks all oil (Dec.).....	15,139,000	(Inc.)	32,421,000
Indicated demand..	828,858,000		779,818,000
Daily average.....	2,270,000		2,137,000

These figures show a gain of 54,000,000 barrels in demand for all kinds of oil during 1926 over 1925. Applying the same rate of increase to 1927 over 1926, total requirements for all oil would be close to 885,000,000 barrels, or daily average of 2,423,000 barrels.

Allowing for 60,000,000 barrels net imports this year, this would leave a balance of 825,000,000 barrels of crude to be supplied by domestic fields.

Such a demand on domestic production would average about 2,260,000 barrels daily, an average of 154,000 barrels a day more than during 1926, the record year.

At present, domestic production is more than doing this, but it must be remembered that of our current production of 2,400,000 barrels of crude daily, 400,000 barrels is coming from three flush pools—Seminole, Panhandle and Spindletop. Thus, one barrel out of every six is coming from flush pools which may not be confidently expected to maintain their yield over any prolonged period.—(*Wall Street Journal.*)

COAL

PRACTICAL OPERATING MEN'S DEPARTMENT

NEWELL G. ALFORD, Editor

Practical Operating Problems of the Coal Mining Industry

THE FIRST SLOPE MINE IN HARLAN COUNTY, KENTUCKY

Cost Of Development Met By Coal Produced As Work Advanced—Conveyor Equipment Used On 19-Degree Slope—Ninety-six Percent Recovery Of Coal—Steel Tipple With Shaker Screens And Picking Tables—Electric Cap Lamps Used Exclusively

By VINCENT L. DENUNZIO *

THE plans, equipment and operation of the first slope mine in Harlan County, Ky., are of considerable interest. The mine has developed into one of the lowest cost producers in the Southeastern Kentucky field. Although the production is now only 29,000 tons per month, or about 1,200 tons per day, an increase to 3,000 tons per day will be made within a short time. As a mining investment the mine probably will prove to be an exception.

In order to explain the conservative way in which the mine was planned and developed it is necessary to give a brief sketch of the operating company, especially since it owns two mines, operated as individual units, on the same property but in different seams. One is a drift mine, the other a slope mine.

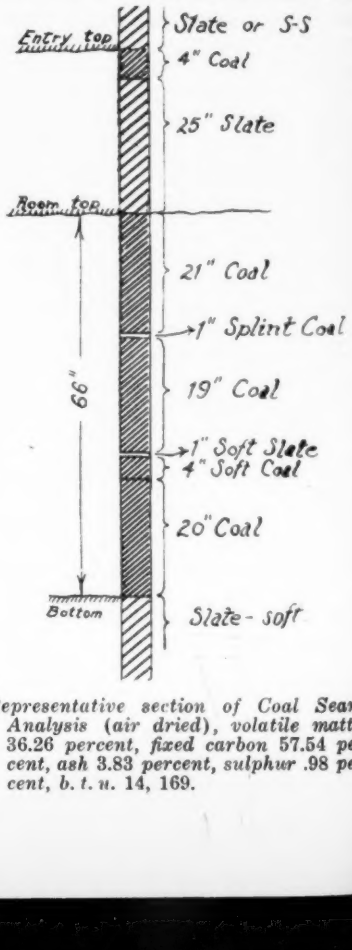
The mines are owned and operated by the Cornett-Lewis Coal Co., Louellen, Harlan County, Ky. The company was organized in 1918 with a lease of about 2,400 acres of coal lands between Clover and Poor Forks of the Cumberland River, about 17 miles east of the town of Harlan.

The property acquired had been well prospected. Sections and analyses, from extensive outcrop and core drill prospecting, showed that there were two exceptionally good commercial seams, the High Splint, an excellent domestic coal, and the Harlan, a good steam and coking coal. The High Splint seam lies practically horizontal, 650 feet from the top of Big Black Mountain and about 1,400 vertical feet above the proposed railroad. The Harlan seam is 54 feet below drainage at about 100 feet from the most desirable and economical location of a future tipple.

As the High Splint seam appeared the more favorable of the two, development of it began, first with the extension of the railroad from High Splint Station to Louellen, a distance of 2.5 miles, followed by the construction of the camp, incline, and tipple. The first coal was shipped in 1920. This drift mine now has its maximum production of 1,200 tons per day.

After having placed the drift mine in the High Splint seam on a production basis it was decided to open up the Harlan seam, developing as and when business conditions permitted, and to equip the mine for a capacity of 3,000 tons per day after it had been developed.

Since many avoidable difficulties and mistakes, resulting, in part, from insufficient forethought, mining knowledge and planning, were experienced in the development of the Splint drift mine, competent consulting engineers were employed to investigate and recommend the best and most economical way in which to open up, equip and develop the Harlan seam, which appeared below water level. After many years of work, plan-



Representative section of Coal Seam; Analysis (air dried), volatile matter 36.26 percent, fixed carbon 57.54 percent, ash 3.83 percent, sulphur .98 percent, b. t. u. 14, 169.

* Mining Engineer, Louisville, Ky.

ning, developing, revising, and experimenting, the plant was completed. Development work started in 1921, but the permanent equipment, tipple, conveyor, etc., was not installed until 1925. During the interval the coal produced paid for the development work. The mine was idle only for a period of two months, during the construction of the tipple, conveyor, etc.

The mine portal is 10 feet above the railroad, 149 feet from the tipple and about 84 feet above the bottom of the coal. The slope is 270 feet long on a 19° (about 34 percent) dip (see Figure 2). It is 18 feet wide, has a minimum height of 6½ feet, and is not timbered or lined. On the left hand side of the slope is the supply track, on the right a flight of steps and between the two a 42-in. rubber belt conveyor.

Views Showing the Plant of the Cornett-Lewis Company, Louellen, Kentucky, Under Construction and In Operation.

This conveyor runs from under a 40-ton bin in the mine (81 feet from the intersection of the slope with the bottom of the coal and 22 feet below the coal), to the tipple, a distance of 462 feet, at a speed of 360 feet per minute, delivering coal at the rate of 400 tons per hour. From the intersection of the slope with the coal to the bin discharge, the conveyor leaves the 19° pitch and travels on a 650-foot radius curve, thus affecting a desirable coal discharge on the belt. The conveyor drive is located at the mine portal, 95 feet from the belt discharge pulley in the tipple. A tandem figure 8 drive is used. Power is furnished through a 100-h. p. slip-ring induction motor, operating at 800 r. p. m.

The belt is supported by a five-roller idler, Timken bearings. Slack in the belt is taken up by weights connected to the pulley at the foot end of the conveyor.

The all-steel tipple is small, compact, yet equipped to handle 3,000 tons in eight hours, making three grades of coal if desired. The tipple has shaker screens, two loading booms with picking tables, a refuse conveyor and bin and a camp coal bin for egg coal or mine-run. The camp coal and refuse bins have a combined capacity of 40 tons, and may be used for slate from the mine discharged over the conveyor belt. The slack or mine run track is between the block and egg tracks. A small storage bin has been placed at the mine run or nut and slack discharge, in order that railroad cars may be shifted without stopping the conveyor screens. The egg coal is rescreened.

At the slope bottom there is a 40-ton bin under the mine haulage track. Coal or rock is fed from this bin to the belt by a horizontal shaker feeder, which retains a cushion of coal at the bottom of the bin. The drop from the feeder to the belt is slight.

All the machinery drives are controlled from one central station in the tipple.

The development of haulageways along carefully planned lines has resulted in no delays or interferences of trips at the slope bottom. Special constructed all-

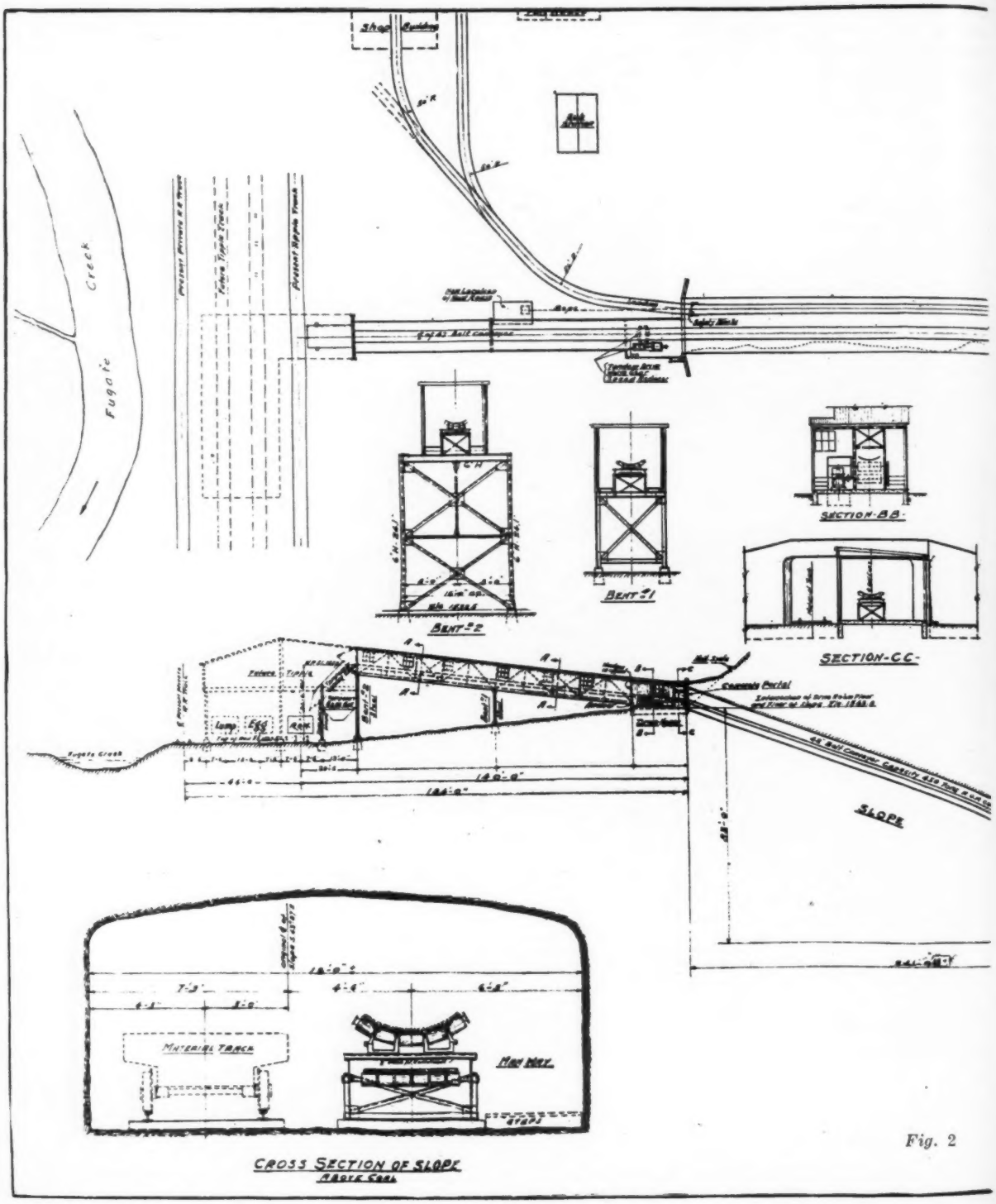
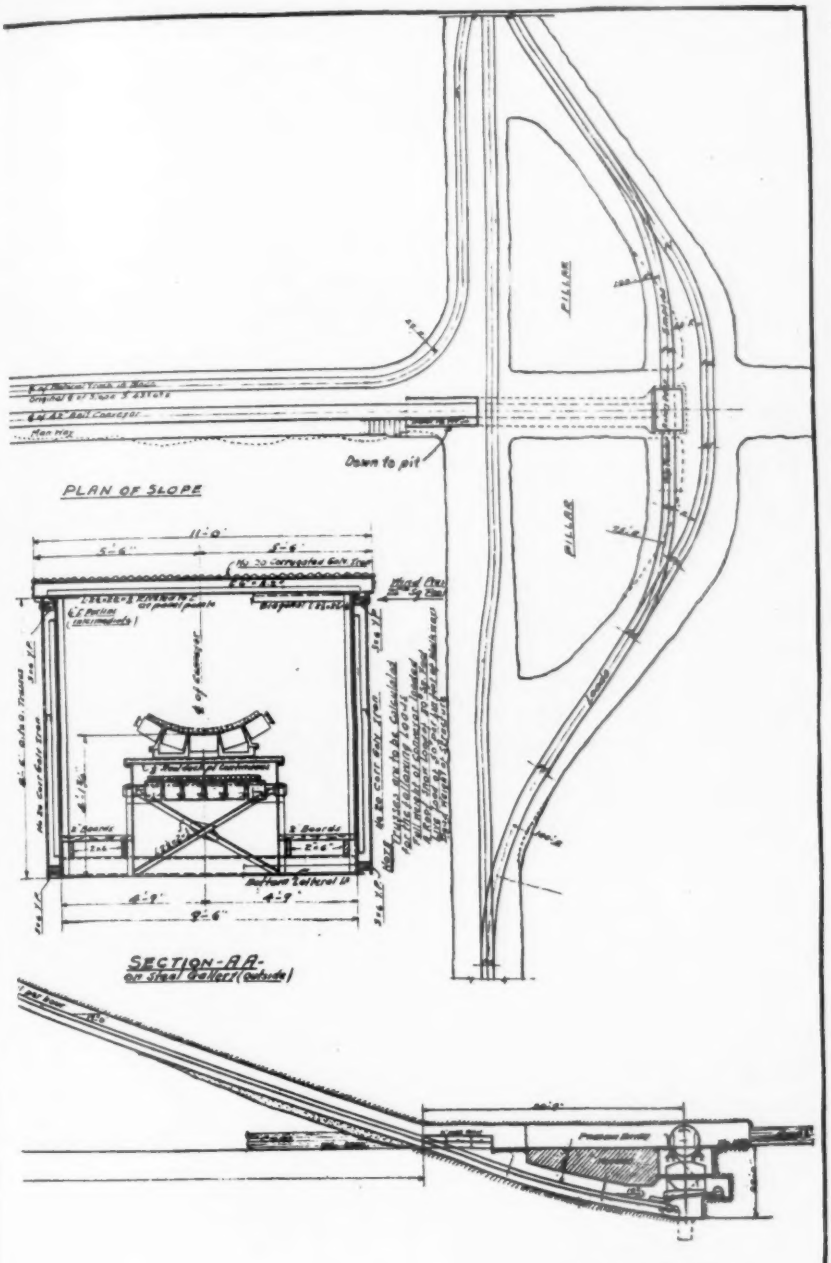


Fig. 2

steel, drop bottom cars has greatly facilitated the movement of trips at the slope bottom. All trips converge to the main haulageway about 400 feet from the slope bottom, pass over the coal bin, automaticaly discharge the coal, and return to the entries which they serve, without switching, uncoupling or interference.

Under this arrangement one man is used at the slope bottom or dump for checking cars. The tipple men and car droppers deliver supplies from the outside to the inside, with the use of an electric hoist; the material track parallels the belt in the slope.

The mining plan used may be called the Eavenson, a combination of advance and retreat mining. By this method a high recovery of coal may be obtained from under "poor" top and with a minimum of development work. A main "load" haulageway splits the coal boundary in half. An "empty" haulageway and four air-courses are driven on 60-ft. centers, parallel to and following the main "load" haulageway. Haulageways are driven 12 feet wide, aircourses 12 to 20 feet wide, depending on roof conditions. At intervals of 500 feet, to the left and right of the main



GENERAL LAYOUT
SLOPE BELT CONVEYOR
CORNETT-LEWIS COAL CO.

haulageway and at right angles to them, producing entries and air-courses are driven. Rooms are turned off the entry side only and are driven to a length of 500 feet. Figure 1 shows the method of advance and retreat mining.

Rooms are driven on 60-foot centers and only wide enough, never more than 18 feet, for a loader to clean up a cut in one shift. A pillar of coal from 42 to 48 feet wide is left. Room breakthroughs, 12 feet wide, are driven every 60 feet of coal. Room mining is not done on the face of the coal but on the quarter-locks.

Excellent results have been obtained on the recovery of pillars, a recovery of 96 percent, including entry and chain stumps. Generally the slate roof will not stand up longer than a year. It is exceedingly important to drive the rooms up as fast as possible and to immediately start recovery of the pillars. For this reason the clean-up system was put into effect. Room work advances 140 feet per month. When possible and safe the pillars are worked from behind, at times as machine coal and at times with hand mining. However, the majority of pillar coal is recovered by the "pocket and peg" method. A pocket 12 feet wide is driven through the pillar about 12 feet from the end. This coal is cut. The remaining 12-ft. peg is then pushed out with the pick. The results of this method are (1) a large percentage of machine coal from pillars, (2) working places are comparatively safe, (3) a saving in timber used.

The ventilation of the mine is provided through two shafts, one for the intake air and one for the exhaust air and escapeway. Only one of these shafts has been completed. It has an area of 200 square feet and is 84 feet deep. The slope is now used for exhaust air. A Robinson 6 by 4 reversible turbine fan has been installed at the shaft. This fan, at present, must be used as a blower on account of the dump at the slope bottom. The air is divided into four splits at the shaft bottom, each split feeding a different section of the mine with fresh air. Fresh air travels along the haulageways to the working places. Overcasts and permanent stoppings are built of concrete.

The mine is not rated as gaseous at the present time, nor has it been gaseous at any time, although small amounts of methane have been found. However, closed lights, Edison Model E electric cap lamps, and permissible dynamite are used throughout, as an extra safety precaution because of the possibilities of gas. The mine is wet and not dusty.

The operation of the mine is interesting, principally because of its difference from current and "customary" practices of the Southeastern Kentucky field, and secondly because a high production record is obtained with a comparatively small amount of equipment, comparatively under the following conditions: (1) the roof is not exceedingly "good," (2) over half the coal is produced from pillars, (3) advance room work is all narrow, (4) a thin parting in about the center of the coal must be removed.

The mining equipment for the present production of 29,000 tons per month or about 1,200 tons per day, consists of two 29-C Arcwall mining machines (one of these machines has cut as high as 12,000 tons of coal in a month), three 8-ton Jeffrey cable reel locomotives, one 6-ton General Electric cable reel locomotive, and 100 mine cars having a capacity of 2¼ tons level full. Loaders are paid by the car. The average haul is about one mile. The motors tram as well as

Fig. 1

gather. Motor crews place and gather to and from the face. All main haulage track is of 60-pound steel. Producing entry and room haulageways are laid with 30-pound steel. Forty-pound steel ties are used in rooms. The track gauge is 48 inches.

The mine is divided into sections; each section has from 12 to 14 loaders, a motor crew (motorman and coupler or snapper), and a shot-fireman. The shot-fireman is (*Continued on page* 142)

PERMISSIBLE ELECTRICAL EQUIPMENT FOR GASEOUS MINES

Permissible Electrical Apparatus Being Gradually Developed—First Consideration Is Safety Which Justifies Added Expense For Permissible Equipment—Electrical Apparatus In Frame Of Loaders And A More Compact Design Obtained

By CHARLES H. MATTHEWS *

PERMISSIBLE electrical apparatus or, as it is sometimes called, "flame-proof" or "explosion-proof" equipment is being gradually developed for use in gaseous mines or in mines where there is a possibilty of the presence of explosive gases.

Cutting machines have been for some time furnished with permissible motors and control at very little increase in cost over the usual non-permissible construction. Motors and control for cutting machines are built in and really form part of the assembled machine, so that the extra cost for permissible construction is not great.

Electrical apparatus can also be built in the frame of loading machines and a more compact design obtained.

Portable air compressors, gathering pumps, conveyors, rock dusters and storage battery locomotives can not so readily be built with the electrical equipment as an integral part of the frame of the machine.

The extra cost is not all caused by the special mechanical construction, but is mainly due to the larger frames needed to obtain the required ratings when the electrical parts are totally inclosed.

When comparing the usual open type of motor having ample ventilation with one of the same rating totally inclosed there is a considerable difference in the physical dimensions.

Permissible construction requires larger flanges where the parts are bolted together. Screwed type covers for inspection and minor repairs and adjustment are preferred to the bolted covers. Ball or roller bearings replace the usual sleeve bearings at some increase in cost, but save in operating expense where the maintenance of motor bearings is sometimes neglected. Special construction is needed where the motor and control power leads enter the permissible cases. These extra details of construction cost less than the difference between the sizes of the open and totally inclosed frames.

Figure 1 shows a comparison between a 5 H.P., 1,150 R.P.M., continuously rated open motor with a motor of the same rating, totally inclosed or of permissible construction.

The totally inclosed permissible motor, having more material and being constructed of heavier parts, must cost more than the standard open motor; besides, the open motor, in addition to its lower material cost, is manufactured in large quantities with subsequent lower cost.

When an electric motor is totally inclosed, there is no ventilation, and the only way to get rid of the heat is by radiation from the frame. There is a limit to the amount of heat that can be radiated from a given frame surface without overheating the internal electrical parts. For this reason it is not economical to build a continuously rated permissible motor much over 20 H.P., as beyond this capacity the physical size of the motor frame would be too large for the usual available space for mounting and the cost would be prohibitive.

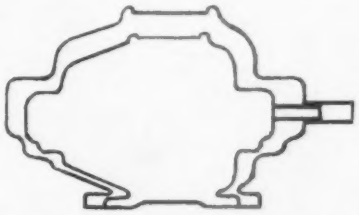


Fig. 1. Comparison in dimensions between 5 H. P., 1,150 R. P. M., open and totally inclosed motors.

An intermittent rated motor can be built for any desired horsepower capacity as evidenced by large totally inclosed mine locomotive motors. Mine locomotive motors are designed to carry full load for one hour at 75° C. rise, but will operate for longer periods of time at much reduced ratings. An intermittent rated, totally inclosed motor may have a high one-hour rating with a very low continuous rating. The only reason for a design of high intermittent rating is to obtain a motor that will handle high-peak loads for short intervals, such as the duty on mine locomotives, cutting machines, or room hoists.

A totally inclosed mill motor will absorb considerable heat before reaching a dangerous temperature, but beyond a definite time the temperature will exceed safe limits. Consider a standard series wound, totally inclosed mill motor, which can be given any of the following ratings:

Time to reach 75° C. rise	Horsepower	R.P.M.
¼ hour.....	45	420
½ hour.....	40	440
1 hour.....	30	525
2 hours.....	35	590
5 hours.....	20	680

It will be noted that this motor can, when starting cold, or at room temperature, be operated at 45 H.P., but will reach a temperature of 75° C. rise at the end of 15 minutes. The 20 H.P. for five hours run does not represent the continuous rating of this motor, as the design has been proportioned for operating at high-peak loads for short periods of time.

Gathering pumps and conveyors require continuous rated motors, while air compressors are operated on a cycle which may require a definite R.M.S. rating.

Loading machines require motors of a definite R.M.S. rating and must frequently operate at high overloads. Therefore special attention must be given to the design of motors for operating loading machines, as experience has shown that intermittent rated motors are seldom suitable.

Room-hoist motors are designed on a short-time intermittent basis, as the service is such that frequent overloads occur, and no definite load cycle can be determined, due to the varying conditions of operation.

Data is already available or can be readily obtained on the power required to operate the various coal-handling machines, so that proper application of motors and control can be made.

Seldom are coal-loading machines designed with definite considerations for the selection and mounting of the driving motor and control. This has usually been the cause of failure of either the electrical equipment or various mechanical parts of the machine.

Frequently a small intermittent rated motor has been used, due to the inadequate space provided, thus resulting in a failure of the electrical equipment. Mechanical parts fail when they are not designed to withstand the strains transmitted through the gears and other speed reducers from the motor.

After the model machine has been built and tested a reliable design can then be built, if all mechanical parts are proportioned for the torques developed by the driving motor.

The driving motor can be designed for the service and can be protected from excessive overloads by the proper application of the control, so that the finished machine will perform successfully without unusual maintenance cost.

Permissible cutting machines are no longer considered special, so where permissible cutting machines are required

* Engineer, Mining Engineering Section, Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.

Permissible Electric Locomotive

it is imperative that loading machines must also be of permissible construction. This requirement means a design of loading machine to accommodate the larger dimensions of permissible motors and control.

Permissible control must be designed to open all power leads and must be provided with overload protection for the motor in the form of magnetic contactors and thermal overload relays, hand-operated circuit breakers, with overload trip or fuses. If fuses are used, it is generally advisable to provide two sets, so that the machine will not be put out of commission if one set of fuses burn out. If the controller is designed so that it will be impossible to open the fuse compartment except when the switch is open, one set of fuses will be sufficient.

In designing permissible control with a view in keeping the cost to a minimum a double-throw, fused knife switch for throwing the motor directly on the line at full voltage has been considered.

This is perfectly good practice for squirrel-cage induction motors and can be used on 230-volt direct current motors. However, for 500-volt direct current motors either a special design of motor is necessary or a ballast resistor must be used.

Throwing a direct-current motor on the line at full voltage is entirely practical, but, if the motor is frequently started, a starter having at least two points must be used.

Motors for rock dusters, gathering pumps, portable air compressors and conveyors can best be controlled by magnetic starters, as the equipment can not be abused, since all parts are entirely inclosed and can only be operated by a start-and-stop push button.

Mine locomotives must be controlled either by a drum controller or a master controller with magnetic contactors and necessary resistors with provision for overload protection and other control accessories.

On room hoists operated through friction clutches the motor only requires a starter, but where the motor speed is controlled a drum controller, together with resistor and overload protection, is required.

The first cost of permissible equipment appears high, when comparing with the usual commercial class of electrical apparatus, but in making any comparison of values all phases of the problem must be considered.

The first consideration of permissible apparatus is one of safety for the lives of the workers and the mine property. This is sufficient justification for the added expense, but, in addition to this, a mine operator receives full value for the money expended in a design of equipment fully inclosed and protected from mine water and dirt and provided with protective features which will prevent the abuse of equipment, thus keeping the maintenance and operating costs to a minimum.

SLOPE MINE IN HARLAN COUNTY

(*Continued from page* 140)

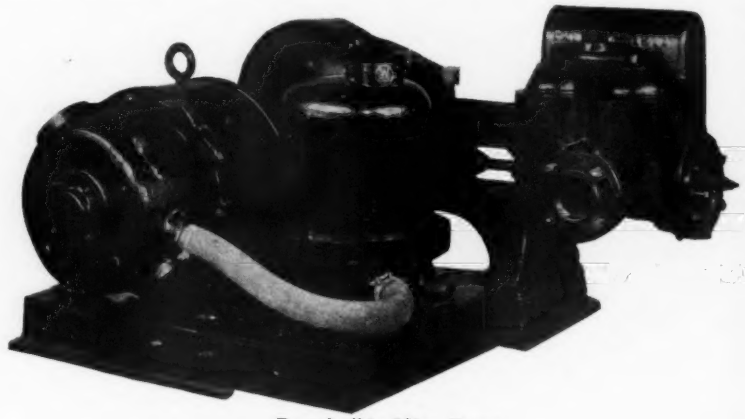
in active charge of the section. The section is allowed only two cars for each loader. They must turn-over these cars at least four times in order to clean-up the section.

The loader has no dead work. He loads coal and sets timbers. The track is laid, coal holes bored (electrically), supplies delivered and the coal cut and shot down by the night-shift crews. 20.3 tons per man per day on pick and machine coal, in 6 hours.

Places are cut only wide enough for the loader to clean up his cut in a shift.

As shown in Figure 3, an average parting of ¾ inch is found about 24 inches from the bottom of the coal, in the form of soft slate. The parting is removed. An arcwall machine, equipped with the "goose-neck" type of cutter bar, 7 feet in length, cuts directly above the parting. The coal of the upper bench is then shot down by the night shot-fireman. The loader removes this coal, then shovels off and gobs the parting. The day shot-fireman shoots-up the bottom bench which is loaded out during the same shift by the same loader.

Water is removed from the working places by various types of piston pumps



Permissible Mine Pump

Under this arrangement loaders average and piped or ditched to a main sump. This sump is drained by a 4-inch single stage centrifugal pump, delivering 825 gallons per minute through a 6-inch pipe under a vertical head of 150 feet. The pump operates at an efficiency of 68 percent and is automatically controlled.

BUNKER COAL NOW DUTIABLE AT CANADIAN PORTS

The customs regulations permitting duty-free bunkerage of coal at Canadian ports have been modified by an amendment of January 1, 1927, which provides that ships bunkering at Montreal and other ports east must pay duty at the rate of 50 cents per ton on bituminous coal imported from the United States, according to the Department of Commerce.

The new regulation gives Canadian mines protection on bunker coal in eastern Canadian ports, the duty-free privilege remaining in force east of Montreal. Bituminous coal is regularly dutiable at 50 cents per ton (2,000 pounds avoirdupois) but duty-free entry of bunker coal has heretofore been permitted at Canadian ports.

Plant at Bellingham Coal Mines

COAL WASHING AT BELLINGHAM MINES*

A Description Of The Coal Handling And Preparing Plant At The Bellingham Coal Mines' No. 1 Mine

SITUATED within the extreme northwest county of the United States and inside the city limits of Bellingham, Washington, is Mine No. 1 of the Bellingham Coal Mines, the largest strictly commercial mine in the state, and at the present writing producing 1300 tons of sub-bituminous coal per 8-hour day.

The coal is mined from Seam No. 1 which lies at a vertical depth of 265 feet below the surface at the nearest point. The coal seam lies at an average dip of 10 degrees from horizontal and has a bearing of S. 62° 30″ W.

In November 1918, beginning at the surface a slope was driven down 600 feet on a 30° dip intersecting a 13-ft. seam at a vertical depth of 300 feet and actual mining operations began August 15, 1919, coal being hoisted up the single track slope in cars holding 2 tons net and six cars per trip. In 1924 the management in order to increase the production in proportion to the increased sales, decided to sink another slope on an 18° angle directly above the No. 1 slope to intersect the coal measures on the present workings below the third level and thereby be able to hoist through either slope with the same hoisting engine and power, thus by the same operation bring up nine cars or 18 tons per trip on the new slope as against six cars or 12 tons per trip on the old slope. This slope was started late in 1924, being completed and placed in operation November 16, 1925. All coal from the second and third levels is hoisted up the 30° slope, and all coal from the fourth, fifth and sixth levels is hoisted up the 18° slope. The changing from one slope to the other is accomplished by lifting or lowering the end of a bridge operated by steam which is hinged at the lower end. When the bridge is in the upper position the cars go down the old slope and when in the lower position they go down the new slope.

The inside methods of mining are similiar to other mines operating on slope haulage. Thus, at distances of every 500 feet on the slope a pair of cross entries or levels are driven right and left respectively, and are driven to a distance of 250 feet from the main slope before the first room is turned—thus leaving a 250-ft. pillar on each side of the slope. From this point rooms are broken off on 50-ft. centers with 30-ft. neck and then widened out to 20 feet leaving a 30-ft. pillar. All crosscuts are driven on 60-ft. centers. Empty cars are taken to working face by counter balance, double tracked; loaded car going down one side pulls empty up the other side.

In some portions of the mine where shortwall undercutting machines are employed a panel incline is driven up through from one level to the other on the full rise of the seam and rooms turned off right and left on 45-ft. centers, 20-ft. room and 25-ft. pillar. A small electric hoist is situated at the top of the incline at the level above and serves to pull the loaded car up out of the room neck and then lower it to the level below where the cars are made up into trips of six or nine as the case may be, and then hoisted to the surface where cars are handled by rotary power dump. The coal is prepared by hand picking of the larger sizes, and screening and washing of the smaller sizes. Namely, all coal passing over a 3½ in. perforated shaking screen is graded as lump; egg size, minus 3½-in. and over 1¾-in.; nut minus (*Continued on page* 146)

Approximate analysis average face sample:

	Percent
Moisture	6.01
Volatile Matter	35.39
Fixed Carbon	42.82
Ash	15.77
Sulphur	.245
B. T. U.	11,000

	Unwashed Pea Coal Percent	Washed Pea Coal Percent
Moisture	6.45	7.20
Vol. Matter	32.96	35.50
Fixed Carbon	36.95	40.51
Ash	23.64	16.79
Sulphur	.19	.26
B. T. U.	9,190	10,890

	Unwashed Nut Coal Percent	Washed Nut Coal Percent
Moisture	7.00	7.01
Vol. Matter	29.28	34.23
Fixed Carbon	32.87	41.27
Ash	30.85	17.49
Sulphur	.26	.24
B. T. U.	8,173	10,934

	Unwashed Slack Percent	Washed Slack Percent
Moisture	7.23	13.85
Vol. Matter	33.43	32.57
Fixed Carbon	38.98	37.84
Ash	20.36	15.74
Sulphur	.26	.25
B. T. U.	9,541	10,460

Refuse from Tables

	Percent
Moisture	16.11
Vol. Matter	19.66
Fixed Carbon	8.89
Ash	55.34
Sulphur	.20
B. T. U.	2,709

Approximate tonnage through the plant is from 1250 to 1350 tons per 8-hour day. The approximate tonnage of washed coal is from 1050 to 1150 tons divided as follows based on washed tonnage:

	Tons
Pea	234
Slack	260
Egg and Nut	574

Screened to sizes as shown above.

The power consumption on the above tonnage is approximately one-sixth horsepower per ton.

* Data furnished by E. P. Lucas, General Manager, Bellingham Coal Mines, Inc., Bellingham, Wash.

THE NATION'S VIEWPOINT

A Digest Of The Expressed Opinions Of Leaders In American Affairs

CONGRESSMAN **Charles E. Winter,** Wyoming, addressed the House recently concerning our public lands question. He took issue with the present trend toward conservation, declaring that conservation is not so important as development so far as our mineral resources are concerned. In part he said:

"There are those who inquire as to conservation. Our trouble is not to conserve, it is to develop. Immense mineral resources lie idle. Conservation means wise use, not imprisonment forever. Conservation is applicable only to the forests and to gas; even as to gas, methods have been worked out whereby the lignite coal of the West can be converted into gas. There is enough coal in one State of the eleven, Wyoming, to provide the entire United States for 300 years. Other States have almost as much. It was stated by scientists and statisticians at the International Coal Conference, held in Washington last month, that there is enough coal in this country to last the United States 3,000 years. It is ridiculous to talk of conservation with respect to coal. There are yet great fields producing oil by flow or by pump. Many more fields are being and will be discovered. When they are gone we will mine the sands that are left in these fields, which will still hold 60 to 70 percent of their original content of oil. When these are exhausted and before, there are 10,000 square miles of oil shale in Wyoming, Colorado, and Utah—the Green River formation—from 500 to 2,500 feet thick, which have been officially determined to contain 60,000,000,000 barrels of oil. New, efficient processes are being invented to extract oil from coal. The coal deposits of the West are absolutely inexhaustible. Long before any of these sources of oil are exhausted, it is obvious and conceded by all that new and important sources of power, light, and heat will be discovered and applied. Coal can be pulverized and used as oil and gasoline are now used. Electricity can be generated at these tremendous coal deposits that will rival in endless quantity the hydroelectric power of our eternal rivers. It is not conservation that it is needed, it is development. These great deposits of fuel minerals can not be wasted. Who will waste them, and how can they be wasted? And why, if they could be, would any State, any more than the Federal Government, waste them? These are great manufacturing deposits rather than mining ore as with hard metals. They will produce only enough to supply the demand and no more, and that will be on a small margin of profit.

"The same is true of phosphate and potash and sodium, which are also embraced in the mineral leasing act. There are in my State alone deposits of phosphate and potash sufficient to supply the Nation with these elements of soil enrichment for hundreds of years. I cite you to the reports of the United States Geological Survey of the state geologist of Wyoming which show 200,000,000 tons of potash on the surface, in the Leucite hills of Sweetwater County, and with it, in the same material, are 200,000,000 tons of aluminum. It is not the saving of these things we need; it is use. Meanwhile we ship our potash from Germany and France. No one as yet has ventured to suggest that the metalliferous minerals—gold, silver, copper, lead, and zinc—should be brought under a leasing bill in order to conserve them and regulate their production.

© 1926, *Kansas City Times*

Rolling Home the Log

Nashville, Va., Times-Dispatch

Looks Like a Bumper Crop

United States Senator **Reed Smoot,** in an article appearing in a current issue of *Tariff Review,* said that he did not believe that the tariff principle is in danger in this country either politically or sectionally. In presenting his reasons for believing that the present tariff will not be reduced, he said:

"What is the essential difference between a moderate or inadequate tariff such as that of 1913, and an adequate tariff such as that of 1922?" asks the Senator. "The difference between domestic success and failure. The width of this chasm is determined by circumstances that may differ in each case or commodity. That is a matter of investigation and inquiry. A 'competitive' or low tariff under the plea of 'tariff reform' was tried in 1894 and again in 1913. Neither worked to the advantage of American industry or labor. The facts of economic history prove this.

"The competitive tariff of 1913 would again have proved the fallacy of its underlying principle had it not been for the World War. When the war was over and the 1913 tariff stood upon its own feet the usual economic disaster following a low or competitive tariff ensued.

"I do not believe that the principle of protection in this country is in great danger politically or sectionally. The farmers, a host of rabid agitators to the contrary notwithstanding, will think twice, I believe, before they indorse another tariff revision downward under plea of 'tariff reform.' And added to this is the beginning of one of the most significant changes in economic viewpoint this country has ever seen, namely, the growing tide of an adequate tariff sentiment in the increasingly industrial South.

"The greatest danger perhaps arises out of the fact that the large amount of private American capital being lent abroad, added to the public funds advanced to foreign governments during the war may become a powerful factor in a movement either to cancel the Government's share of these foreign obligations or to permit foreign countries to pay these debts by unloading in the American markets large quantities of competitive merchandise.

"I am profoundly conscious of the perils we face as a Nation. I have been in Washington a longer time than has been the fortune of many other men. During the whole time, however, I have tried to keep in view the welfare of the nation as a whole. I know no class, no group, no section. I have been a consistent advocate of an adequate tariff for this country all my life, and in this I believe I have been defending American industries, American labor, and American prosperity.

"I deny that the policy of adequate protection is class legislation. I deny that it is a tax on the many for the benefit of the few. Whatever may be added to the costs of living in this country because of an adequate tariff law is made up many-fold by the resulting advantages of that law.

"The tariff of 1922 is not perfect; no tariff ever was or will be. But its essential principles are sound and can be successfully defended. I have never yet heard an argument against the policy of protection that can not be successfully answered.

"It may be that we have reached another parting of the ways, and that the country must again weigh in the balance the virtues of a 'competitive,' moderate or low tariff on the one hand and an adequate protective tariff on the other. I shall always be found on the side of adequate protection, for I am an American."

Washington Star

Wallace Press-Times

Well?

"To be or not to be—that is the question." Much speculation is being indulged in as to the possibilities of a coal strike, with the expiration of the Jacksonville contract. The *Wall Street News* fears that whether the strike shall materialize or not, its threat may result in an inflation that has been avoided throughout this period of industrial prosperity. They say:

"Contract between the coal mine operators and the miners' union in the central bituminous competitive field, which embraces Ohio, Illinois, Pennsylvania, and Indiana, expires on March 31. Before that time the operators, if preliminary indications are right, will demand that the new agreement involve a 20 percent reduction in wages, and the union may be expected to take an equally positive stand against any such cut. There will probably be a period in which both sides will be deadlocked and quite possibly that deadlock will continue beyond the date when the present contract expires, in which case the country will have on its hands another coal strike.

"While there is no threat of an actual shortage of bituminous coal even if workers in the central competitive field decide to stop digging, it is almost a certainty that a strike would result in higher prices for the bituminous product generally. Potential overproduction would be no preventative of this, for no matter how much coal the country can mine if it wishes to, the public may rest assured that the philanthropy of the mines which continue operating will not be sufficient to furnish coal at unchanged prices. We are not that near the millennium.

"And if coal prices advance, coke will advance; and if coke advances, pig iron will also, and before the cycle has been completed consumers of finished steel will know that a strike is on somewhere down the line. Some hint at the possibility of such developments is already to be seen in the high rate of ingot operations of the leading unit in the steel industry, for ingot production is being maintained at a rate out of line with current production and consumption of the product turned out by the rolling mills. If a strike should come the plants will be well heeled with low-cost ingots to be sold in finished form on a rising market for everything.

"Thus it is not at all a fantastic conception which sees in the threatened coal strike the probability of a reversal in the recent downward trend of commodity prices and the institution of a period of forward buying. It may be that the threat of this strike will be the torch that will set off the inflation which our prosperity so far has avoided but which, in the opinion of many economists, is ultimately as inevitable as it was in the days before and immediately following the

Providence Journal

The Nation's Guide Post

war. And should such be the case industrial stocks may be expected to participate in a sensational rise, inspired by a rush of orders that for a time will make it appear that our prosperity in 1927 is to reach new high records.

"Unfortunately developments such as those here outlined, while conducive to temporary stock market strength, finally would spell an end to that prosperity which for the moment they might seem to be furthering."

Black Diamond, Chicago, however, points out that the great prosperity that would accrue to the non-union fields, in the event of a strike, leaves little doubt as to the attitude of those operators, which is certainly not one of benevolence. They further state:

"Because of the prosperity that would come to the non-union coal fields of this country in the event of a big strike in the central competitive field April 1, it would require almost super-human benevolence on the part of the non-union operators not to wish that it would occur. As a matter of fact, few operators outside of the possible strike zone pretend any such benevolence. Most of them make little effort to conceal their hopes in this direction, even though it involves the apparent misfortune of their competitors.

"And yet, non-union operators, in their effort to hang on until the strike materializes, are doing the very things that create the possibility of a peaceful settlement of the wage controversy in the central field. They are contributing to the weekly surplus production of coal and they are helping to force prices down to levels that preclude the continuation of the Jacksonville wage scale.

"Never was there a moment in the last three years when the United Mine Workers' chances for continuing the Jacksonville scale were brighter than in November when prices were high and even non-union mines were paying wages on a parity with those in the central field.

"During the periods of low prices, however, both union and non-union operators have lost money. The latter felt that they would have a chance to recuperate in the event of a strike this year. For this reason, they have been hanging on desperately and blindly, many who should have closed their mines during the depressions. They were reluctant to disband their organizations. They wanted to be in readiness for the moment of prosperity, both by working mines and by maintaining market contacts. They sold the coal that was produced through this motive at sacrifice prices, forcing the markets to lower and still lower depths. Nor have they maintained the wage scale to which the union officials pointed to substantiate their claims that coal could be mined at profit on the Jacksonville scale.

"The over-production of coal has created market conditions that prove to the union miners their days of earnings will be few and far between if the high scale is maintained. They have had a great sufficiency of similar conditions during the last three years. They may make concessions in the February conference. If they do, the strike will be averted."

William Green, President, American Federation of Labor, in a recent release to the press predicted a year of prosperity and peace for labor generally. He further said:

"Upon labor policies, we can speak with authority, and labor policies are a vital element in business prospects. In those industries in which constructive labor policies resting upon collective bargaining prevail, we can confidentially expect constructive results and developments that will contribute to the health and success of business. The constructive industry, which is a key to work in so many other industries, will probably have another busy year. The bituminous industry, which has refused to reorganize upon an efficient basis or find constructive labor policies, may cause trouble not only for itself but for industries and communities using its product. The textile industry has also to set its house in order.

"Corporation for efficiency is one of the necessary functions which trade unions can perform when management opens the way. Our movement has fixed labor standards that mean the maintenance of efficient and constructive uses of tools and materials—a necessary component of a successful business. We have established standards of wage and hours that make for good citizenship as well as act as stabilizing forces in industry. By opposing wage reduction we join forces with the Federal Reserve movement to eliminate industrial waste, and develop better industrial standards, which, in turn, check currents tending toward business booms and depressions and ill-advised expansion. By protecting the human element in production, we have forced consideration of values that come from securing the cooperation of the creative and constructive capacities of wage earners."

COAL WASHING AT BELLINGHAM MINES

(*Continued from page* 143)

1¾-in. and over ¾-in.; pea coal minus ¾-in. and over five-sixteenths-in.; steam coal, five-sixteenths-in. and down.

After passing over the shaking screens the lump coal is conveyed over a moving picking table 48 inches wide by 50 feet long, thence over loading boom to railroad cars. Any rock or other impurities is picked out when passing over picking table and thrown into the waste or refuse bins. A piece of rock that may have some coal hanging to it or any piece of high ash coal is picked out and thrown into the bin leading to the crusher to be crushed down to minus 2-in. before being elevated to the raw coal bins above the jigs. An average egg and nut coal is handled through three separate nut jigs from whence it flows to a Luhrig dewatering elevator and elevated to a point above a double shaking screen where it is sized and sprayed by water before passing to the railroad bins.

The raw pea and steam coal after passing through main shaking screens is elevated and discharged into a 5-16 in. wire mesh revolving screen, the pea coal passing directly into the bin above the Link-Belt jigs. The steam coal size drops to a 12-in. screw conveyor and finds its way to the bins above the washing tables. The pea coal is fed out automatically to the jigs, and after passing over the jigs it flows to the boot of a Luhrig dewatering elevator and is elevated to railroad bins.

The steam coal passes out of the bin by individual automatic feed to five Universal Overstrom washing tables, thence to boot of a dewatering elevator situated at the end of the settling tank, then up the elevator to bins above the railroad.

ROEBLING MINERAL COLLECTION

John A. Roebling, of the Roebling Rope Co., has presented to the Smithsonian Institute what is said to be one of the finest collections of minerals in the world. This collection originally belonged to W. A. Roebling, builder of the Brooklyn Bridge. The gift was accompanied with the endowment of $150,000 to insure maintenance of the collection. This is the second collection of great importance to have been given the Smithsonian within recent months; the first coming from F. A. Canfield, of New Jersey, with an endowment of $50,000. The Canfield collection contains 9,000 specimens, and the Roebling collection 16,000 specimens. The scientific value of the collection is said to be of inestimable value.

D. W. BRUNTON TO BE AWARDED GOLD MEDAL

The American Institute Of Mining & Metallurgical Engineers Has Selected Mr. Brunton As The Recipient Of The First Award Of The William Lawrence Saunders Gold Medal, To Be Presented At Its 135th Annual Meeting

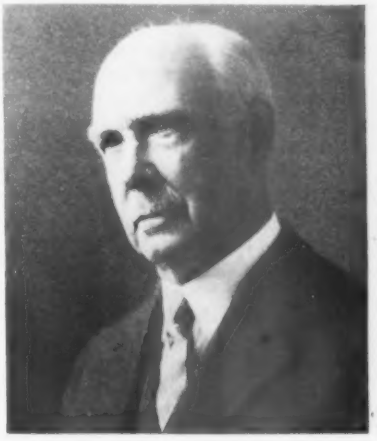
THE MINING Metal Committee of the American Institute of Mining, Metallurgical and Mechanical Engineers, has voted to recommend to its Board of Directors, that the first award of the William Lawrence Saunders Gold Medal be made to David William Brunton, consulting mining engineer, of international note. The medal will be awarded "For development and exposition of the principles and practice of ore sampling; for systematic daily mapping of mine geology; for the Brunton Mining Compass, and for engineering achievements in connection with great tunnels."

Mr. Brunton is one of the leading engineers of the country, and in the latter half of his fifty-five years of engineering experience has been employed as consulting engineer by many of the largest mining companies in this country and Europe. In addition to the endless miles of levels driven in mines with which he was connected, he has been engineer for the Cowenhoven Tunnel, Aspen; the Roosevelt Tunnel, Cripple Creek; the Laramie Poudre Tunnel, Mountain Home, Colo.; the Meaderville Tunnel, Butte; and engineer to one of the contracting firms for the Rogers Pass, now known as the Connaught Tunnel.

The Cowenhoven Tunnel, two and a half miles in length, was driven through very difficult ground, much of it requiring driven lagging, and as the work was completed without a single serious accident, the miners, to show their appreciation of the precautions which had been taken for their safety and comfort, presented Mr. Brunton with a beautifully designed gold medal.

Mr. Brunton has also been a prolific inventor, having about thirty patents to his credit. The best known of these, though perhaps not the most important, are the time-sampling machine and the pocket transit. The time-sampling machine has practically revolutionized the methods of sampling precious metal ores.

When the United States was drawn into the World War, each of the principal engineering and technical societies offered the Government the services of two of its members, which offer was gladly accepted, and the organization was known as The War Committee of Technical Societies. Quarters were provided by the Government for this organization, first in New York and later in the Army and Navy Building, Washington. Mr. Brunton was elected chairman of this body and soon organized it into such an efficient and useful machine that he was appointed a member of the United States Naval Consulting Board and of the General Staff of the United States Army. How these different organizations were able to function together will be seen from the following



D. W. Brunton

quotation taken from Capt. Lloyd Scott's History of the Naval Consulting Board:

"After the establishment of the Washington office and before making that office the main office of the Naval Consulting Board, cordial relations had been established with the Inventions Section, General Staff of the Army, and Mr. Brunton, the member in charge of the Naval Consulting Board's work in Washington, was made on May 10, 1918, a member of the Advisory Board, Inventions Section, General Staff, by order of Gen. Payton C. March. As the Inventions Section had just recently been organized, Mr. Brunton was able to give that body a great deal of information in regard to the experience of the Naval Consulting Board in handling inventions from the public, and rendered to them a needed service. Thereafter cooperative and cordial relations were maintained between the two organizations, and inventions for army use were sent to the Inventions Section of the General Staff by the Naval Consulting Board and vice versa.

"Mr. Brunton was also a member of the National Research Council. As a result, he was able to bring about direct relationships with all these organizations which greatly increased their efficiency."

In his report to Congress for the year 1918, the Secretary of the Navy made special mention of this work in the following paragraphs:

"During the past year the War Committee of the Technical Societies, composed of representatives of the great engineering societies, associated themselves with the Naval Consulting Board, and their chairman, Mr. David W. Brunton, was elected a member of the board.

"With the erection and occupancy of the New Navy Building, space was provided for the resident member and a staff of examiners directly connected with the office of the Secretary of the Navy, and all files and correspondence have been concentrated in one location, bringing the examination and consideration of ideas and inventions in closer touch with the Navy Department. The office of the board is in charge of Mr. Brunton, who is also a member of the advisory committee to the inventions section of the General Staff of the Army, and there is established a close working basis of handling all ideas presented to the attention of the proper authorities with the least effort and by a very direct route. This has not only resulted in increased efficiency, but in a reduction of expenditure of funds and time consumed."

After the war, Mr. Brunton resumed his practice as consulting engineer and is now chairman of the Board of Consulting Engineers for the Moffat Tunnel, which on completion will be the longest railway tunnel in the United States. Its total length will be a trifle over six miles.

In appreciation of distinguished service to his country during the World War, through his work on the Naval Consulting Board, the following letter was sent him:

"The Navy Department takes pleasure on Navy Day, October 27, 1926, in extending to you hearty greetings and again expressing its appreciation of the patriotic, intelligent and whole-hearted service rendered during the World War, by the Naval Consulting Board, of which you are a member.

"The unselfish example set by the board has done much to emphasize the vital importance of the Navy to the future progress of the nation.

"With this in mind the Department feels that it may now assure itself of your support in its present Navy Day endeavor to bring to the attention of our

people the aims, needs, and benefits of the Navy and to stress the importance to the nation of our peace-time place upon the high seas."

His engineering record is of special interest, as he was the first to employ a regularly organized staff of geologists in actual mining operations.

To bring the work of the geologists before the superintendents and foremen in such shape that they could fully understand it, he devised a system of mapping whereby all of the data and information collected by the geologists could be readily grasped and utilized.

For the Amalgamated Copper Co. he connected all of their mines in Butte with a central modern pumping station, which of course enormously reduced the cost of pumping.

For the mines in which there were fire areas, he designed a gas mask to be connected by a flexible pipe to the compressed air system, an arrangement which provided both fresh air and cooling and enabled the workmen to build air-tight bulkheads with safety and comfort around all fire areas.

For the San Dionisio mine, owned by the Rio Tinto Mining Co., in Spain, he devised an entirely novel system of mining which is enabling them to recover, with both safety and economy, 80,000,000 tons of ore that had been considered unobtainable.

Owing to the difficulty of framing and using round logs, which are never exactly the same size, the Didesheimer system of timbering, generally used in big stopes, has necessitated the use of square timbers. A round timber has aproximately double the strength, twice the life and half the cost of a timber cut from its inscribed square. To utilize these advantages, he devised and patented a system of round timber framing, which made an immense saving in the cost of timbering in mines.

In ore sampling, various investigations had shown the old systems to be inaccurate, and he devised what is known as "time sampling," a system whereby a falling stream of ore is deflected alternately to the right and left into separate bins for varying periods of time. For instance, if the falling stream is directed into one compartment for one-fifth of a second and into another for four-fifths of a second, there will be received in one a 20 percent sample and an 80 percent reject in the other. This 20 percent sample is then crushed to half size and the operations of sampling and crushing repeated alternately until the resultant sample is sufficiently fine and small to be utilized in the laboratory.

Mr. Brunton was the first to recognize the value of the Leyner drill for tunneling operations; has done much to improve tunneling methods, ventilation and transportation.

In connection with the experiments of the U. S. Bureau of Mines for utilizing medium to low grade iron ores such as are found in Mississippi and northeastern Texas, a further development has been made in Sweden, whereby coal gas is purified of carbonic acid and sulphur, and circulated and regenerated in an electric gas stove. Coke, charcoal, or lignite may also be used, and the electrical energy as well as the fuel required, have been reduced to about one-third the quantity used in former methods. Iron of a comparatively low percentage may be advantageously utilized by this method.

Realizing the necessity for a small portable and at the same time accurate instrument for reconnaissance work on surface and underground surveying, he invented and patented what is known as the Brunton transit, which is now in use by 30,000 engineers, geologists and topographers all over the world. Two thousand of these instruments were in use at the front during the World War, and since its termination this instrument has been adopted as standard equipment for United States Engineer troops.

As the result of a long series of tests undertaken at Fort Benning, Ga., the Brunton transit has been selected as "standard equipment for the United States Engineer troops." It was with this instrument that Prince Caetani made the surveys which led to the most spectacular exploit of the Great War, the blowing up of the Col de Lani.

He was awarded the Telford premium by the Institution of Civil Engineers in London, England, and was given a gold medal by the miners employed in driving the Cowenhoven Tunnel.

Mr. Brunton has served two terms as president of the American Institute of Mining and Metallurgical Engineers and one term as president of the American Mining Congress; is also a member of the American Society of Mechanical Engineers, the Institution of Civil Engineers, the Royal Geographic Society, the American Society for the Advancement of Science, and the Colorado Scientific Society.

PRODUCTION OF BITUMINOUS COAL IN 1926

The Bureau of Mines' final estimate of bituminous production for the calendar year 1926 gives a total of 578,290,000 tons. This figure will stand until detailed statistical reports can be collected from all the mines.

Judging from past experience, the final returns are not likely to raise or lower the estimate more than 2 percent. A test of the accuracy of the work in a given year is afforded by comparing the total of the 52 weekly estimates for that year with what the complete reports of the operators later show to be the actual production. In nine years the maximum error has been 3.4 percent, the minimum error one-tenth of one percent, and the average error about 1.9 per cent. The following statement shows the results for four years prior to 1926.

Year	Preliminary estimate		Actual production as later reported by operators		Percent of error in the estimate
	Net tons	Date Published	Net tons	Date Published	
1922	407,712,000	Jan. 1923	422,268,099	Oct. 27, 1923	—3.4
1923	545,300,000	Jan. 1924	564,564,662	Oct. 18, 1924	—3.4
1924	483,280,000	Feb. 1925	483,686,538	Nov. 14, 1925	—0.1
1925	522,967,000	Jan. 1926	520,052,741	Nov. 20, 1926	+0.6
1926	578,290,000	Jan. 1927	.....	.....	....

The estimate represents the production of coal, including mine fuel, local sales, coal loaded direct into locomotive tenders at mines, coal charged into beehive coke ovens, shipments by waterways, and shipments by rail. The estimate is based upon the following information, collected currently.

(1) Cars of coal loaded by the principal carriers, including non-revenue railroad fuel, furnished by the American Railway Association.

(2) Cars loaded by certain private roads not reporting to the American Railway Association, collected direct by the bureau.

(3) Coal loaded for shipment on the Monongahela, Allegheny, Ohio and Kanawha Rivers, reported by the United States Army engineers.

(4) Cars of beehive coke loaded by the principal coke carriers, collected direct by the bureau, from which the coal charged into beehive ovens is determined.

The reports of cars of coal loaded are converted into equivalent tons, making very careful allowance for the varying size of the carload on different roads. The average load (as distinct from the theoretical capacity of the car) is now about 49½ tons per car. In the final estimate allowance is made for the unknown items, namely coal loaded by some scores of small railroads of Class II and III not reporting, coal loaded on minor waterways, local sales, coal loaded direct into locomotive tenders, and mine fuel.

These several sources of information furnish an adequate basis for estimate, and as shown by the check against the complete returns later furnished by the operators, the margin of error is probably within 2 percent.

INDUSTRIAL CORPORATION IN WEST VIRGINIA

(*Continued from page* 121)

differences, the ensuing good will is often positively nauseating.

Most of the larger companies of West Virginia have some sort of working agreement with their men and machinery for taking up complaints, while many just announce from time to time what the market is doing and what wages the business will stand. There is a general feeling that the 1917 scale is the low point during the present cost of living. One company with about two thousand employes has been asking them to sign individually a simple one-page working agreement guaranteeing the 1917 scale as a minimum and an advance when conditions make an advance possible. It was under this clause that the recent advance was made.

There is no occasion to become maudlin over the good will situation. It is not a talked-up proposition but just a natural result of natural causes. These are the same men who went on the "Mingo March," and, under proper, or improper, conditions will raise h—l and heckle the bosses just the same as before. All the analysis discloses is that there is a certain reaction after extremes of any kind and that following natural economic laws is conducive to natural conduct.

As the closing months of the year felt the influence of the British strike, prices began to advance, apparently more because they were talked up than by reason of any actual shortage of coal. In fact, the basis for this flurry was so artificial that pretty nearly every one knew exactly what was ahead and how far ahead it was. Still, wages shot up not only to the Jacksonville scale, but, in some cases, a little beyond. This action in advancing wages was interpreted in two ways; some said it could have been done all along, and others that fear of the miners' union could have the credit. As there was no uniformity either in the putting on or the taking off, and as practically the whole state had resumed the 1917 scale by the first of the year, neither reason assigned seems to fit. Mr. Lewis said, but not quite convincingly, that the advance was a vindication of his war-wage scale. He has not indicated what the resumption of the 1917 scale vindicates. The men themselves were none too sure what all the upheaval was about, but having a big Christmas bonus handed to them seemed no serious mistake. The thing lends itself quite easily to analysis, both before and after the event: A coal mine is never dead until it is worked out. There are many mines even in West Virginia that only operate when coal prices rise above a given level. So, when the prices rocketed, not only did the mines in the central competitive states start up as rapidly as they could be gotten ready, but these idle West Virginia mines opened up almost over night, showing that someone was watching things. Now, the report that there are too many miners is all wrong—there are just too many mines, and when these idle mines wanted to operate, the first thing they needed was men. The only place from which they could obtain men was from the working mines, and the only way the men could be induced to leave was to offer higher wages. The only way to keep the men from leaving was to raise the bid; thus it happened that "the fire began to burn the stick, the stick began to beat the dog, the dog began to bite the pig, etc."

Many operators must be given credit for seeing exactly what was happening. With unreasonable men bent on holding on to the advances and resisting the reductions, they might have just sat tight and pocketed both the profits and the loss of men, but the men had shown for three years that they too were observing and thinking. There was a chance to redeem promises and still resume the 1917 scale when the flurry was over. Every operator handled it as his business demanded. Some gave the advance for two weeks and some for two months; some advanced in full and others only part way.

The encouraging thing is that most of the employes seem to have accepted the situation as it was explained to them, and to many it did not need be explained. They took the Christmas bonus and made merry. There was never before in the memory of the most remembering prodigy such an orgy of Christmas buying in the coal fields. And, when contracts were presented for renewal on the 1917 scale, the only operation of which the writer has positive knowledge, had its agreements signed up in a few days by the men coming voluntarily to the offices one at a time and signing with no further pressure than an announcement that it would probably help the business for the buyers to know that the company was all set for another year. So far as has been reported there has not been a case of industrial trouble in West Virginia occasioned by the sudden advance of wages and the equally sudden resumption of the 1917 scale.

From all this the immediate conclusion is that the guarantee for industrial cooperation is the free working of economic laws right out in the open where men can see. There is reason for them to believe that no combination of circumstances can prevent the coal business of West Virginia from sharing its profits with the miners so long as there are more jobs than miners, which will be the case any time the price is within reach of the idle mines which will start up and bid for men when profits are in sight. All that man can do is to bring about a certain curtailment and start the laws to operating in another quarter.

MOTOR FUELS FROM COAL

Perfection of certain processes for the carbonization of coal may be expected to provide substitutes for oil and gas, if needed in the future, states A. C. Fieldner, superintendent of the Pittsburgh Experiment Station of the Bureau of Mines. Mr. Fieldner, who was detailed by the Bureau of Mines to investigate various European processes for the low-temperature carbonization of coal, suggests that in the ideal process the full yield of primary oils will be extracted from the coal by carbonizing at gradually increasing temperatures to remove all the volatile matter from the coke. Then the coke will be converted by way of the water-gas reaction to carbon monoxide and hydrogen which, when heated under high pressures in steel autoclaves in the presence of suitable catalysts, may be converted into alcohols suitable for motor fuel. Dr. Fischer, of the Institute of Coal Research, at Mulheim-Ruhr, Germany, has succeeded in making such a mixture of alcohols ranging from methanol to an alcohol containing nine carbon atoms. This mixture, termed "synthol," was made at 150 atmospheres pressure and 400° C. by use of a catalyst composed of iron oxide impregnated with alkali. The fuel gave satisfactory service in a motor-cycle engine. Methanol is now made in Germany by a similar process in copper-lined autoclaves, with zinc oxide as catalyst, at a manufacturing cost of 18 cents a gallon.

The Bergius process, recently developed in Germany for converting coal into oil, also offers great possibilities for the treatment of western bituminous and sub-bituminous coal. In this process, as used at Mannheim, pulverized coal, mixed with oil or tar to form a thick paste, is heated at 400° C. in a steel autoclave under a pressure of 150 to 200 atmospheres of hydrogen. Under these conditions the coal is converted into a black, tarry liquid which, on distillation up to 300° C., yields oils and tar to the extent of 30 to 60 percent of the weight of the coal. The by-products are ammonia and gas.

This process, Mr. Fieldner considers, could provide in the future ample quantities of substitutes for the products now obtained from petroleum. Reserves of coal in the United States are ample for many years. The time when such a process can be profitably worked will be determined by price levels. The results of Mr. Fieldner's investigations are contained in Bureau of Mines Technical Paper 396 "Low-Temperature Carbonization of Coal," which may be obtained from the Superintendent of Documents, Washington, D. C., at a price of 15 cents.

NEWS OF THE MINING FIELD

A Résumé Of The Activities Of The Mining Industry And Items Of Interest In The Field

Metal Mines

The Bureau of Mines reports that 126,713 men were employed at metal and nonmetallic mines in the United States in 1925, an increase of 3,585 over 1924. They worked 37,172,359 man-shifts, an average of 293 work-days per man, as compared with 35,734,008 man-shifts and 290 work-days per man in 1924. Each of the larger branches of the industry except iron mines showed an increase in the number of employes. Iron mines employed 2,000 men less than in 1924, but the reduction was counterbalanced by an increase in the average working time per man from 269 days in 1924 to 275 days in 1925.

Utah Copper Establishes New Record

Improvements at the Utah Copper Co. during the year 1926 are of outstanding importance. These include electrification of shovels formerly operated by steam, electrification of its transportation system and the founding of a model community near Bingham, Utah. Ore production broke all records both from the standpoint of metal production and tonnage of ore mined. Dividends increased to $1.50 per share. Their new model community at Cooperton is said to be an excellent example of employe housing; 18 houses have been completed and 20 more are under construction.

Tom Reed Resumes Operation

The Tom Reed Mining Co. will resume operation of its Oatman, Ariz., property which for the last few years has been operated by Jack Shank and associates. Since the mine was first opened it has produced $14,000,000 in gold.

Portland Discovers Ore Shoot

The Portland Gold Mining Co. has announced the discovery of a large ore shoot on the 2,600 level at Victor, Colo. The ore has been opened in virgin ground and from the geology it is estimated to be a valuable discovery.

Phelps Dodge Gets Patent

A patent recently issued to the Phelps Dodge Corporation transfers 160 five-acre mill sites to the Morenci Branch of the Phelps Dodge Corporation. This is believed to be the largest patent ever issued in Arizona.

Lead-Zinc Company Organized

The Duluth Lead and Zinc Co., with an authorized capital of 30,000 shares of a par value of $10 each has been organized to develop a property in the Tri-State district. The company is incorporated under the laws of Minnesota and it is understood it is under the control of Michigan mining men.

MINING MEN OPPOSE EXTENSION ROCKY MOUNTAIN NATIONAL PARK

Colorado mining men have taken up the fight to prevent the extension of the boundaries of the Rocky Mountain National Park to include Arapahoe Peaks and other mineral bearing ground in that district. Their opposition is centered to the proposed bill in Congress to revise the Park limits. The opposition is based on the belief that if the region were placed under the jurisdiction of the National Park Service, it would become impossible to file mining, water or power claims. About 60,000 acres are involved.

Big Royalties Paid

Quapaw Indians in Oklahoma received royalties of $1,679,836 from production of lead and zinc under leases on their lands last year, according to a report of the Interior Department. This was an increase of $422,717 over the previous year. Lead and zinc mined on the lands of the Indians during the year amounted to 289,622 tons as compared with 259,432 for the previous year. The gross value of the production last year was $17,672,498 against $15,135,569 over the previous year an increase of $2,536,929.

Power Projects

The Silver Spar Mining Co., of Idaho Falls, Idaho, applied to the Federal Power Commission for a preliminary permit for a power project on Little Wood River, Blaine County, Sawtooth National Forest, Idaho, for mining purposes.

The Hiwassee Power Co., of Knoxville, applied for a preliminary permit for six power projects in Hiwassee River, Cherokee National Forest, Polk County, Tennessee, for the manufacture of chemicals.

Colorado Fuel and Iron Co.

At its meeting on December 30, 1925, the Board of Directors of the Colorado Fuel and Iron Co., elected J. B. Marks executive vice-president of the company, effective January 1, 1927. Mr. Marks will have supervision over all departments of the company's activities.

Keystone Consolidated May Reopen

Late reports state that the American Mines Development Co. recently secured an option on the Keystone Consolidated at Amador City, Calif., and will soon start unwatering this old producer. The Keystone has a production record of approximately $20,000,000 and has been developed to a depth of 2,900 feet. The major part of the ore produced came from above the 1,400 level. The South Spring Hill Consolidated is also included in the option.

Air Transportation Service To Canadian Mining Fields

According to a statement in a publication of the Canadian Government, a new airplane service will be inaugurated to the mining district east of Lake Winnipeg in the Province of Manitoba, Assistant Trade Commissioner W. J. Donnelly, Montreal, informed the Department of Commerce. The line will be operated by the Western Canada Airways, Limited, Winnipeg, Manitoba, of which Mr. James A. Richardson, of the Winnipeg Grain Exchange, is president. A large Fokker monoplane which will be used has been piloted from Peterborough, New Jersey. The wheels have been replaced by skis.

Anaconda and Katanga Copper Companies Merge European Forces

A merging of the European continental selling organizations of several U. S. producers with those of Belgium has been announced. The Anaconda Copper Co. and subsidiaries, Calumet and Hecla Mining Co., and United Verde Copper Co., have combined in the same selling agency with the Union Miniere du Haut Katanga and Societe General Metallurgique d'Hoboken. It is understood that the Kennecott Co. and its affiliated properties and the American Smelting and Refining Co. will continue to maintain independent selling organizations in Europe.

INSURANCE PLAN FOR MINING COMPANIES

THE Bunker Hill and Sullivan M. & C. Co., the Hecla Mining Co., the Sierra Nevada Cons. Mining Co., the Sullivan Mining Co. and the Caledonia Mining Co., all of the Coeur d'Alene district of Idaho, have adopted an insurance plan for their employes which is in effect free life insurance, which applies in case of death not covered by the State Compensation Law. Should the death benefit under the state law be less than that provided by the companies, the difference will be made up under the plan just adopted. The insurance applies to all employes from superintendent down the line, and there is no difference made with reference to position. The amount of benefit depends upon the length of the continuous service of the employe. Dependents of an employe who has worked one year and less than two, will receive $500 and from that the amount is graded up to employes who have 10 years or over who receive a maximum of $2,000. The following provision is made in the policy:

"The benefits herein provided for shall neither be assignable by the employe, nor subject to attachment or garnishment by his creditors, nor shall the benefits inure to his estate after death, nor to his beneficiaries or legatees by will, but shall be payable only to his dependents designated by him in the manner prescribed in these rules and regulations, or in case the employe shall leave no dependents, such sum as the company may determine as hereinbefore provided, may be paid by the company to such person, firm, or corporation as the company may determine, to aid in the defraying of expenses of sickness or funeral; provided, however, that no right to such payment is given to the personal representative or creditors of such deceased employe."

Belmont Exercises Option

The Belmont Copper Co. has completed payment of $140,000 for the property at Superior, Ariz., which it has had under option during the past two years. Sinking of the shaft to the 1,600-foot level has been completed and exploratory drifting on the 1,450 level is now under way.

A. McKay is president of the company and Chester Hootson is vice-president and manager.

Simon Silver-Lead Production

Production of the Simon Silver-Lead Co., near Mina, Nev., is now averaging 240 tons daily with an output of concentrates of 35 tons per day. Concentrates are valued at $135 per ton, chiefly in silver and lead.

Development Progress at the Western Apex Mine

The Western Apex Mining Co., Oatman, Ariz., has made arrangements to utilize the United Eastern shaft. This has been unwatered to the 850 level and a crosscut is being driven to get under the ore body that has been developed for a length of 1,275 feet on the 700 level. Operation is under the direction of George W. Long, of Los Angeles.

Oliver Iron Gets New Equipment

The Oliver Iron Mining Co. will purchase 5 steam locomotives, twenty-five 30-yard, side-hinged, air-dump, steel ore cars and two 4-yard, full-revolving, caterpillar-mounted, electric shovels. For the Virginia district there will be purchased five steam locomotives, thirty 30-yard side-hinged, air-dump, steel ore cars and two 4-yard, full-revolving, caterpillar-mounted, electric shovels. The Oliver has also been authorized to reline "A" shaft of the Pioneer mine at Ely, Minn., on the Vermilion iron range, from surface to 1,466-ft. level. The upper portion from surface to a depth of 160 feet or that part of shaft where the surface slip occurs, is to be lined with timber sets and fire-proofed with cement applied with a cement gun. The remaining 1,306 feet of shaft is to be relined with reinforced poured concrete. The work will commence in the near future. With the completion of relining of Pioneer "A" shaft all Oliver shafts on the Vermilion range will be strictly fire-proof. The Soudan mine shaft and Pioneer "B" shafts are lined with reinforced poured concrete and the Sibley shaft is lined with steel sets and concrete lath.

Lead-Silver Strike Reported

The Anaconda Copper Mining Co. has made one of the most important "strikes" in recent years in the Tintic mining district, according to dispatches from Salt Lake City. The discovery, of which the New York offices of the company were advised, is a drift that penetrated the mineralized zone of the operations for 100 feet, all but twenty feet of which is in rich ore. The development of an important lead-silver producer is indicated, it is said.

Kennedy Mine Busy

The Kennedy Mining and Milling Co., Jackson, Calif. has been busy the last several months in the electrification of its hoisting equipment. A 750 h.p.-motor has been put in to operate the hoist and installation of a new 1200-type air compressor is just being completed. Further improvement including a new steel headframe will be under way in the near future.

North Star Mine at Amador City Reopened

Unwatering of the North Star mine at Amador City, Calif., to the 600 level has been completed and explanatory drifting has begun. Roger Beals, formerly connected with the Bully Hill and Rising Star mines in Shasta County and Fletcher Hamilton, former state mineralogist are associated in the direction of operations.

Inspiration Leaching Plant Operating Successfully

The leaching plant of the Inspiration Consolidated Copper Co. is producing approximately 100,000 pounds of copper daily. It is operating at two-thirds capacity. It is reported that metallurgical results are equal to or slightly better than estimated. Tailings from the leaching operation contains 0.17 percent copper. The plant was completed at a cost slightly under the estimated cost of $6,000,000.

MacNaughton Named President

James MacNaughton, General Manager of the Calumet and Hecla Mining Co., has been elected president of this company to succeed R. L. Agassiz, who is voluntarily retiring from that position. Mr. MacNaughton will continue his residence at Calumet. He has occupied both the positions of general manager and vice-president of Calumet and Hecla since 1900 and was prior to that time engaged in the iron mining industry in Michigan. Under his management the company has prospered and expanded until it is one of the world's largest copper producers.

Seeking Lead Mines in Montana

The St. Louis Smelting & Refining Co. is reported to be seeking lead properties in Montana and with this object in view Lester Frink, chief engineer of the company, has already started out surveying parties in various parts of the state to locate lead properties. The St. Louis Smelting & Refining Co. is a subsidiary of the National Lead Co. He says that the improvements in lead-zinc ore treatment the past few years should result in a number of Montana properties entering the lead field.

Large Companies Securing Promising Acreage

The Federal Mining and Smelting Co., the largest producer in the Joplin district, has taken an option on the White mine, for which it has agreed to pay $250,000 if drilling proves favorable. In addition it is understood that this company has leases on 6,000 acres at Granby, as well as several thousand acres of land in the Duenweg and Spring City districts. The Kansas Exploration Co. has purchased the Ritz lease near Cardin, Okla., and the St. Louis Mining and Smelting Co. is actively developing a large acreage near Baxter Springs. This company has considerable acreage under lease and plans to build a large mill if underground development work proves satisfactory.

Report of Census Bureau

The Census Bureau reports that in 1925 there were 358 companies in the petroleum refining industry which produced $2,373,178,014 worth of products, an increase of 32.3 percent over 1923. They employed 65,218 wage earners and paid wages amounting to $104,484,602. Of the refineries 63 were in Texas, 57 in California, 51 in Pennsylvania, 50 in Oklahoma, 19 in Kansas, 15 in Wyoming, 13 each in Louisiana and Ohio, and 10 in Kentucky.

There were 125 aluminum manufacturers who produced $125,696,767 worth of products, an increase of 17.5 percent over 1923. Of the companies 22 were in Ohio, 14 in Wisconsin, 11 in New York, 10 each in Michigan and New Jersey, 9 in Illinois, 8 in Pennsylvania, 7 each in California, Indiana and Massachusetts and 6 in Missouri.

There were 35 companies which produced $23,043,708 worth of safes, vaults and steel burial caskets, an increase of 20.6 percent over 1923.

Potassium compounds valued at $5,897,608 were produced, a decrease of 6.7 percent. Sodium compounds were produced to the value of $110,095,686, a decrease of 1.6 percent.

CONTRACT AWARDED FOR DRILLING FIRST POTASH TEST WELL

Action marking the beginning of the actual drilling campaign under the supervision of the Federal Government in the effort to obtain ample domestic potash supplies was taken when a contract for drilling a test well in Eddy County, in southeastern New Mexico, was awarded to the Sullivan Machinery Co., Chicago, Ill., by Scott Turner, Director of the Bureau of Mines, with the approval of the Secretary of Commerce. The bid submitted by this company was the lowest of four bids received. The company will immediately move equipment to the site designated, and it is anticipated that drilling operations will begin within about three weeks.

The site on which the test well is to be drilled is located on public lands of the United States, and is therefore not subject to restrictions in the enabling act which require the negotiation of leases with all owners of land or mineral rights within a radius of one mile of any proposed test hole. The site is in N.W. ¼ of Section 13, Township 17S, Range 31E, approximately 35 miles east of Artesia, N. Mex., and is within the area recently announced by the United States Geological Survey as holding great promise for the discovery of commercial potash beds. The site is approximately 20 miles distant from the McNutt test well, recently drilled by private interests, cores from which demonstrated the existence of 10 groups of beds containing potash-bearing salts of possible commercial interest. Cuttings from a number of oil wells drilled in the vicinity have also indicated the existence of potash beds.

The New Mexico drilling site is the fifth site recommended to the Bureau of Mines by the Geological Survey as being favorable for potash exploration purposes. The other four sites, located in central western Texas, are affected by the restrictive clause of the enabling act requiring the negotiation of leases with owners of land and mineral rights.

In the progress of drilling the test well, a complete core will be taken from top to bottom. It is anticipated that the top of the potash-bearing salts will be reached at a depth of about 850 feet. The total depth recommended for drilling is 2,000 feet, which may be shortened to 1,850 feet or extended to 2,300 feet, depending upon developments. The cores obtained will be turned over to the Geological Survey for study and analysis.

Bills modifying the terms of the potash enabling act, by eliminating the requirement of obtaining leases from all owners of land and mineral rights, have been introduced in the Senate and the House of Representatives. It is thought that passage of these bills will facilitate the drilling of test wells on favorable sites previously designated in Texas.

The Condition of Union Finances

According to the last report of the auditors of the United Mine Workers of America, the international union as of November 30, 1926, had on hand a balance of $610,748.58, as against a balance of $718,112.13 on May 31, 1926. Total income during the half-year was $890,945.46.

The current report is in a highly condensed state. For a long time it was customary to report to the membership just where the funds were deposited, giving the names of the banks. In this report, however, more than a half million dollars are accounted for in two simple items:

"Amount on deposit, International Executive Board, U. M. W. of A., $335,746.27.

"Amount on deposit, Thomas Kennedy, secretary-treasurer, U. M. W. of A., $245,172.93."

Total expenditures for the six months were $998,309.01, or $107,363.55 more than income. Salaries and expenses, of course, were the largest item of expenditure, aggregating $309,764.57.

The itemized account shows that the gentlemen of the law continue to get at least their fair share of the union funds. Six men are mentioned in seven items, their aggregate amounts being $27,143.79. The largest single payee under this heading was Henry Warrum, who under two items got $11,122.78. Indeed, the lawyers got just about half as much as the union donated to the cause of the British mine strikers, since there was $51,000 expended in the latter direction, $50,000 to A. J. Cook, secretary of the British Miners' Federation, and $1,000 given toward the expenses of the secretary of the British relief committee.

Wages of Lead Miners Cut

Workers in the lead mines of Idaho have received a reduction in wages of 25 cents a day as a result of the decline in the price of lead. This is in accordance with the agreement between the mine owners' association and the miners.

Pocahontas Reduces Wages

Pocahontas Coal Operators Assn. has announced that operators it represents have reduced wages 10 percent, effective January 1. This brings practically all of the operations in West Virginia back to the 1917 wage scale.

Study Stream Pollution

A committee of the Western Pennsylvania division of the Isaac Walton League visited the Pittsburgh experiment station of the U. S. Bureau of Mines recently, to ask the bureau to cooperate in an investigation of the stream pollution question. The committee stated that it was negotiating for the use of an abandoned mine in Central Pennsylvania and wished the assistance of the bureau in making chemical analysis of the water before and after the sealing of the property, the investigation to occupy a year's time.

Tipple Burns

The McLane Mining Co. at Washington, Pa., lost its tipple at the Rich Hill Mine through fire, entailing a loss of approximately $100,000. The mine had been producing at the rate of about 1,200 tons per day.

Southern West Virginia Coal Buys Properties

Southern West Virginia Coal Co. has announced the purchase of five mines comprising the entire coal interests of T. E. B. Siler of Charleston, W. Va. This consideration is said to be $2,400,000. These mines are located in the Big Coal River district of West Virginia and it is understood that this company will take over other mines in this district. The Southern West Virginia Coal Company was recently organized with Everett Brennen of Huntington, as president. It is understood that $7,000,000 will be involved in financing the new organization. More than half a million dollars will be spent in developing and improving the properties acquired.

Gallagher Appointed Chairman Pennsylvania Coal Co.

Michael Gallagher, for many years general manager of the Bituminous Coal Mining Department of the M. A. Hanna Co., and more recently appointed to supervise the coal properties acquired by the Van Sweringen interests, has been appointed head of the Pennsylvania Coal Co., which is the chief mining subsidiary of the Erie Railroad. He succeeds the late G. A. Richardson as chairman of the Board of Directors of that company. The Pennsylvania Coal Co. holds extensive coal lands in both bituminous and anthracite fields in Pennsylvania and is capitalized at $5,000,000.

ANNUAL COAL EQUIPMENT EXPOSITION

The American Mining Congress through its Manufacturers Division has announced the dates of May 16-20 as the time for the holding of the National Exposition of Coal Mining Equipment, and the Convention of Practical Coal Operating Officials. The convention and exposition will again be held at Cincinnati, Ohio, where it has been held for three years consecutively. The exposition will be housed at Music Hall, and special arrangements have been made with the Chamber of Commerce to eliminate the difficulties heretofore experienced in the acoustic properties of the auditorium. The sessions will be held in South Hall, in a specially built and arranged auditorium.

The program committee will be announced shortly by the American Mining Congress, and as the program develops the industry will be kept thoroughly informed. The committee will have the assistance again this year of many of those who cooperated in making the 1925 convention an outstanding one.

Coal Exposition

The American Mining Congress announces that satisfactory acoustic conditions will prevail at the Cincinnati exposition hall when it holds its annual coal exposition, May 16-20. This will be brought about by partitioning off a part of the south half of the hall. This change will assure complete lighting and acoustic facilities and remove complaints prevailing over previous expositions.

The National Coal Association had been invited to hold its convention at the same time but has decided to hold its meeting at Chicago, June 15-17.

Alabama By-Products Corporation Begins Construction Work

The Alabama By-Products Corporation has begun work on a tipple and washery plant for the purpose of handling the output from two new slope mines at Praco. They have also announced the starting of work on 29 new ovens to be built for them by the Koppers Co., at Torrant City.

To Build Spur

The New York Central Railroad and the Chesapeake & Ohio Railroad has announced agreement of joint construction and operation of a 29-mile line to run from Swiss, W. Va., to Nallen, W. Va., at an estimated cost of approximately $4,000,000. The plan will be submitted to the Interstate Commerce Commission and action is expected thereon the latter part of January.

Made Mine Manager

Thomas DeVenny has been promoted from the position of superintendent of mines to manager of mines for the Portsmouth By-Product Coke Co., Edgarton, W. Va.; F. L. Long, formerly assistant superintendent, has been promoted to superintendent.

New High Record

During the week of January 8, the Pittsburgh Coal Co. established a new high record for open shop production when it produced 115,784 tons. The average number of men at work was 5,440 which also is a high record.

Eastern Ohio Production Low

Coal mining statistics just released covering production in the eastern Ohio field show that production was only 47 percent of the potential capacity of the field. For the calendar year 1926 eastern Ohio No. 8 Field produced an aggregate tonnage of a little better than 13,000,000 tons, as against an estimated capacity of approximately 36,000,000 tons, or less than 37 percent capacity of the field. Considerable publicity has been given to the meetings of operators for the purpose of selecting representatives to meet with the United Mines officials to negotiate a new wage scale.

Hudson Coal Shuts Down Mines

A slump in the anthracite market is given as the reason for the orders by officials of the Hudson Coal Company, halting all operations throughout Lackawanna and Lucerne counties, Pa. Twenty-two thousand men employed at the Hudson collieries have been thrown into idleness by the order which will continue for an indefinite period. The company is understood to have had little movement of its output lately. In the past month several other large producing companies among them the Glen Alden have met the situation by ordering three and four day vacations.

Nevada Gypsum Production Important

With six producing mines, gypsum has become one of the important minerals produced in Nevada. Production of gypsum has increased to approximately 1,000 tons daily. The producing properties are at Gerlach, Mound House, Arden, Moapa and two at Jean. Several new properties are being prepared for production.

Most of the Nevada gypsum is shipped to plants at San Francisco, Oakland, Los Angeles and other California cities.

L. E. Young

Recently appointed Vice-President of the Pittsburgh Coal Co. in charge of operations.

J. D. A. Morrow

Recently elected President of the Pittsburgh Coal Co.

Coal Operators Meet

Delegates representing the bituminous coal mine operators of the central competitive field, including the states of Pennsylvania, Ohio, Indiana and Illinois met at Toledo, Ohio, January 19, to determine a uniform program in the joint negotiations that will be held with representatives of the United Mine Workers beginning February 14. The decision reached at this meeting together with that of the United Mine Workers at their constitutional convention at Indianapolis January 25, will determine whether these four states will be involved in a union strike on April 1. Among those who attended the meeting were: L. H. Smith, of Spring Valley; M. F. Peltier, of the Peabody Coal Co.; M. S. Coleman, of Harrisburg; Rice Miller, of Hillsboro; H. C. Perry, Hillsboro; E. C. Searles, of the Crerar-Clinch Coal Co.; George B. Harrington, of the Chicago, Wilmington & Franklin Coal Co.; and F. C. Pfahler, of Gillespie, Ill. The alternates are James Needham, of the St. Paul Coal Co.; J. Stuyvesant Peabody, of the Peabody Coal Co.; J. D. Zook, of the O'Gara Coal Co.; S. A. Shafer, of the Moweaqua Coal Mining Co.; O. L. Lumaghi, of St. Louis; R. H. Zoller, of the Bell and Zoller Coal Co.; and W. K. Kavanaugh, of St. Louis.

Institute Meets February 14

Among the subjects relating to the coal industry to be discussed at the annual meeting of the American Institute to be held in New York City February 14-17, is a paper by Walter Barnum, President of the National Coal Association, C. A. Lemm, Consolidated Gas Co., W. H. Fulweiler, and a number of college professors. Howard N. Eavenson, chairman of their Coal and Coke Committee, will discuss the effects of trends in gas manufacture in the coal industry.

Kentucky Coal Operators Meet

West Kentucky Coal Bureau held its annual meeting at Louisville, Ky., on January 13. The chief topics for discussion were freight rates and coal preparation. Officers elected for 1927 were: B. Hart, Hart Coal Corp., Morton's Gap, Ky., president; A. W. Duncan, W. G. Duncan Coal Co., Greenville, Ky., vice president; and C. E. Reed, Louisville, Ky., secretary. The vacancies on the executive committee were filled through appointments of C. M. Martin, Greenville Coal Co., Greenville, Ky.; C. F. Richardson, West Kentucky Coal Co., Sturgis, Ky.; A. P. Barnard, Beaver Dam Coal Co., Beaver Dam, Ky.; G. S. Miles, Gibraltar Coal Mining Co., Central City, Ky.; and P. D. Berry, Providence Coal Mining Co., Providence, Ky.

Winding Gulf Elects Officers

The Winding Gulf Association at their meeting held in early January re-elected for another term P. M. Snyder, Mt. Hope, president; W. G. Caperton, Slab Fork, vice president; Alex Lang, treasurer, and C. H. Meade, secretary. The association also voted to take the lead of other coal fields in reducing labor's wage to that of the 1917 scale.

National Committee on Wood Utilization Awarded Gold Medal

The International Jury of the Sesquicentennial International Exposition has notified the National Committee on Wood Utilization, Department of Commerce, Washington, D. C., that it has been awarded a gold medal for its exhibit. The committee secured the cooperation of prominent forest product manufacturers in the United States and the exhibit showed the various phases of wood utilization of interest to the public.

A. E. S. C. Elects Officers

At the annual meeting of the American Engineering Standards Committee, Charles E. Skinner, a representative of the American Institute of Electrical Engineers, was reelected chairman for the year 1927, and Charles Rufus Harte, representative of the American Electric Railway Association, was reelected vice-chairman.

The other members of the Executive Committee for the year 1927, are as follows:

Samuel R. Bishop, American Institute of Architects; George C. Stone, American Institute of Mining & Met. Engrs.; James F. Callbreath, American Mining Congress; W. C. Cushing, American Railway Assn., Eng. Division; H. H. Quimby, American Society of Civil Engineers; Cloyd M. Chapman, American Society of Mechanical Engineers; John A. Capp, American Society for Testing Materials; C. F. W. Rys, Association of American Steel Mfgrs.; A. H. Moore, National Electrical Mfgrs. Association; S. G. Rhodes, Electric Light and Power Group; A. R. Small, Fire Protection Group; Wm. J. Serrill, Gas Group; W. A. E. Doying, The Panama Canal; Albert W. Whitney, Safety Group; Coker F. Clarkson, Society of Automotive Engineers; F. L. Rhodes, Telephone Group; Thos. H. MacDonald, U. S. Department of Agriculture; George K. Burgess, U. S. Department of Commerce; Nathan C. Grover, U. S. Department of the Interior; Ethelbert Stewart, U. S. Department of Labor; Chief, Bureau of Ordnance, U. S. Navy Department; R. G. Barrows, U. S. War Department.

Reviews Standards Work

The American Engineering Standards Committee in a review for 1926 says there have been notable developments in the industrial standardization movement, including important progress in the mechanical and mining industries. Referring to mining standards the committee says:

"The work of the Bureau of Mines, the American Mining Congress, and of other organizations, on safety rules for installing and using electrical equipment in coal mines, has been unified under the procedure of the committee and formally approved as an American Standard. The work of the sectional committees on drainage of coal mines, outside coal handling equipment, and wire rope for mines, has been practically completed, and it is expected will be formally submitted for the approval of the committee in the near future.

"A particularly important piece of work, which is being considered as the result of a representative conference of interested groups held in Pittsburgh, is the classification of coal as a basis of indus-

trial commercial transactions. The work will cover all grades of coal from lignite to anthracite."

J. F. Callbreath, Secretary of the American Mining Congress, is a member of the executive committee of the organization for 1927.

Review Anthracite Situation

The Anthracite Bureau of Information at Philadelphia, issued a report reviewing conditions in the anthracite industry in 1926.

Referring to the strike from September 1, 1925, to February 18, 1926, the report says the "miners gained nothing as the result of the strike," while they lost $150,000,000 in wages. The loss to the operators was from $35,000,000 to $50,000,000.

Douglas Medal Awarded

The A. I. M. & M. E. will award the James S. Douglas medal to Zay Jeffries at its meeting, February 14-20. Dr. Jeffries is the fifth recipient of the Douglas medal, his predecessors being Frederick Laist, of Anaconda, Mont., in 1923; Charles W. Merrill, president of the Merrill Co., of San Francisco, in 1924; William H. Bassett, of Waterbury, Conn., in 1925, and J. M. Callow, president and general manager, General Engineering Co., New York. The medal is given for distinguished achievement in nonferrous metallurgy and was established in honor of Dr. Douglas, twice president of the institute.

Dr. Jeffries was born in Willow Lake, S. Dak., in 1888, is a graduate of the South Dakota State School of Mines, and received a D.Sc. from Harvard in 1918. He is one of the foremost workers of the country in physics of metal structures. His chief achievements are: Development of a method for measuring grain size of metals; explanations of the phenomena connected with grain growth in and deformation of metals and the effect on their physical properties; the development of crystal analyses of metals by X-ray; theory of the cause of hardening of metals and alloys, especially steel, and the red hardness of high-speed steel.

Aluminum pistons, heat-treated aluminum castings and new types of high-strength wrought aluminum alloys are some important developments attributed to Dr. Jeffries' devotion to the metallurgy of aluminum. He is a member of metallurgical and technical societies in America and Great Britain and has given accounts and experiments through their publications and the technical press.

Sam A. Lewisohn, vice-president and treasurer of the Miami Copper Co., has recently visited the company's mine at Miami, Ariz. He was accompanied by Mrs. Lewisohn.

135TH MEETING INSTITUTE

THE 135th meeting of the American Institute of Mining and Metallurgical Engineers will be held at New York City February 14-16. An excellent program has been arranged and the outlook is for one of the largest and most interesting meetings in its history. Special arrangements have been made for entertainment including the usual smoker. The Women's Auxiliary has arranged an informal dance and a dinner dance will be held at the Waldorf-Astoria. Medals will be awarded at the dinner. The mining and Metallurgical Society and The American Mining Congress have been invited to join the institute in special technical sessions. Bradley Stoughton will deliver the Howe Memorial lecture dealing with alloy steel. The Institute of Metals lecture will be by Professor C. H. Desch of Sheffield University on the subject "The Growth of Crystals." The Coal and Coke Committee will center its program on methods of marketing coal and the ground movement and subsidence committee presents a paper by Robert B. Bosworth on "What Duty does the Sub-surface owner owe to support the Surface."

The Mining Geology Committee will be able, among other papers, to present a summary of the West African manganese deposits, written by Director A. E. Kitson of the Geological Survey of West Africa. A large number of other interesting and valuable technical papers will be presented at the meeting, among which will be the following:

"Plastic Deformation of Coarse Grained Zinc," by C. H. Mathewson and A. Phillips.

"Plastic Deformation of a Zinc Crystal," by Samuel L. Hoyt.

"Corrosion and Physical Properties of Some Alloys of Aluminum, Zinc and Tin," by N. O. Taylor.

"Drainage in the Red Iron Ore Mines of the Birmingham District, Ala.," by W. R. Crane.

"Degree of Liberation of Minerals in Alabama Red Iron Ores After Grinding," by W. H. Coghill.

"On the Nature of the Chromium Iron Carbon Diagrams," by M. A. Grossman.

"Note on the Distribution of Energy in Worked Metals and the Effect of Process Annealing Temperatures on Fine Copper Wire," by Lyall Zickrick and R. S. Dean.

"Tungsten and Thoria," by Zay Jeffries and P. Tarasov.

"Acceleration of the Rate of Oxidation of Ferrous Iron in the Presence of Copper, and its Application to the 'Heap Leaching' Process," by E. Posnjak.

"Deep Hole Prospecting in Eagle-Picher Mines," by W. F. Netzeband.

"Magnesite Mining in California," by Leroy A. Palmer.

"Plastic Deformation of Metals," by J. T. Norton and B. E. Warren.

"Scale and Corrosion Problems in Gasoline Plants," by W. R. Finney and H. W. Young.

"Corrosion in an Oil Refinery," by H. F. Ferkins.

"Bureau of Standards Soil Corrosion Investigation," by K. H. Logan.

"Capillary Retention of Petroleum in Unconsolidated Sands," by L. C. Uren.

"Core Studies of the Second Sand of the Venango Group," by Charles R. Fettke.

"Solidus Line in Lead-Antimony System," E. E. Schumacher and F. C. Nix.

"Grain Boundry Phenomena in Filaments of Tungsten and a few Other Metals of High Melting Point," E. S. Davenport.

"Note on the Relation of Annealing Temperature to Conductivity of Copper Wire," J. C. Bradley.

"Beryllium Copper Alloys," W. H. Bassett.

"A Study of the 470° C. Transition Point in Cast 60:40 Brass," Frances Hurd Clark.

"Relation of Disseminated Copper Ores in Porphyry to Igneous Intrusives," W. H. Emmons.

"Equilibrium Relation in Aluminum-Manganese Alloys of High Purity," E. H. Dix, Jr., and W. D. Keith.

"Some Comparative Properties of Tough Pitch and Phosphorized Copper," Webster, Christie and Tratt.

"Preparation of Metallic Single Crystals with Especial Reference to Single Crystals of Zinc—(Part II)," O. E. Romig.

"Acceleration Stresses in Hoisting Cables in Theory and by Test," G. P. Boomsliter.

National Slate Holds Annual Meeting

The annual meeting of the National Slate Association was held at the Commodore Hotel, New York City, January 18 and 19. Joint sessions were held with the Slate Roofing Contractors and the United Roofing Contractors Association. Group meetings were a feature of the convention.

Anaconda Output Large

The Anaconda Copper Co. at Great Falls, Mont., including the zinc electrolytic plant and the rod and wire mill is operating at full capacity. The zinc and electrolytic plant has increased its output considerably as has the rod and wire plant.

Large Freight Tonnage

The volume of freight handled by the railroads in 1926 was the greatest ever moved by them in any corresponding period, according to complete reports for the year filed by the carriers with the car service division of the American Railway Association.

Loadings of revenue freight for the fifty-two-week period ended on Dec. 25 amounted to 53,309,644 cars. This was an increase of 2,085,492 cars, or 4.1 percent, over the best previous record, established in 1925, and an increase of 4,775,211 cars, or 9.8 percent, over 1924.

This record freight movement in 1926 was handled without transportation difficulties, congestion or car shortage except in a few instances of a temporary nature. It was also moved with the greatest expedition and dispatch ever attained by the rail carriers.

Total loadings by commodities for 1926 compared with 1925 follows:

	1925	1926
Grain and Grain Products	2,406,111	2,305,731
Live Stock	1,603,322	1,635,610
Coal	9,928,059	8,905,384
Coke	692,221	623,331
Forests Products	3,654,432	3,736,824
Ore	2,184,893	2,011,640
Merchandise and L. C. L. Freight	13,457,847	13,192,591
Miscellaneous Freight	19,382,759	18,813,041

Sales of Slate in 1926

The value of the slate sold at the quarries of the United States in 1926 was $12,030,000, according to estimates furnished by producers to the Bureau of Mines. This was 4 percent less than the value reported for 1925. Slate reported sold for electrical, structural and sanitary, and miscellaneous uses (chiefly flagstones) showed increase in both quantity and value, while the other products decreased.

Development of Poland's Potash Resources Proceeding Rapidly

The phenomenal development of the Polish potash industry during the past half-dozen years is revealed in a trade bulletin issued by the Chemical Division of the Department of Commerce. Before the war, the bulletin discloses, Poland consumed each year about 400,000 metric tons of potash salts, practically all of which was imported from Germany. While a Polish company was organized in 1914 to develop the resources of Galicia, its production was negligible until 1917, when it amounted to about 10,000 metric tons. Since this year production has steadily and rapidly increased until in 1925 the amount of potash salts produced reached 151,000 metric tons.

While Polish potash consumption is still far behind that of pre-war years, every effort is being made by the Government to increase the use of fertilizers among the farmers. Instructive literature is being widely distributed; concessions in freight rates are granted, and credits are being made available. The demand is growing constantly, and if agricultural development in Eastern Poland can gradually be brought to the high level already obtained by portions of the country which were formerly German, the potash salt requirements will soon exceed the pre-war consumption.

During the next year, the report states, efforts will be made to eliminate imports of German potash into Poland through the establishment of a concentration plant. Up to the present time no refined potash has been produced in the country, the salts having been merely ground for agricultural uses. It is expected that the new plant will be able to supply the Polish farmers with high-grade salts similar to those produced by the German refineries.

Although Poland may not be a serious factor in international trade in potash, the exploitation of Polish sources of supply, experts believe, may have a material effect on the strength of the monopoly-controlled product and thus be a matter of vital interest to the American potash consumer. It is estimated by a competent authority that in the Galician region there are resources of potash salts amounting to nearly 20 million metric tons.

Utilization of Nation's Enormous Lignite Supplies

The possibility of making a high grade fuel from the enormous lignite deposits of the United States, comprising nearly one-third of the total solid fuel resources of the Nation, is demonstrated by the Bureau of Mines.

Extensive lignite fields lie in states west of the Mississippi, notably in North Dakota, Montana, Wyoming, Colorado, and Texas; smaller areas occur in several other states. The total area of the deposits and the total amount of lignite in the various districts are so enormous that the potential economic value of the deposits is seldom recognized.

The Bureau of Mines approached the lignite problem hoping to produce for domestic purposes a satisfactory briquetted fuel with a heating value comparable with that of other good fuels, and simultaneously to obtain data regarding the cost of operating, the yield and character of the by-products—gas, tar, and ammonia—obtainable under definite operating conditions, the approximate cost of a unit of suitable size for commercial production of such fuel, the factors bearing on the design of a suitable carbonizer, and other pertinent information. The Bureau also hoped to show the possibility of the direct use of the unbriquetted char.

In studying the problem experiments were conducted at Salome, Ariz., Hebron, N. D., and Grand Forks, N. D. Cooperative work was carried on with the University of North Dakota and with the Lignite Utilization Board of Canada.

Carbonizers commonly used for coking bituminous coal are distinctly unsuitable for carbonizing lignite.

The yields of by-products—gas, tar, ammonia, oil, and pitch—depend upon the character and quality of the lignite carbonized, upon the completeness or degree of carbonization, and upon the method and apparatus used for carbonizing. In general the yields are lower per ton of raw lignite than per ton of bituminous coking coal and the quality of the gas is lower, sometimes very much lower than that of coal gas. The value of the by-products from the carbonization of average lignite is considerably less than the value of the by-products resulting from the carbonization of bituminous coal. The recovery of ammonia as ammonium sulphate will probably be unprofitable in the Northwest, particularly in small plants, until some time in the future. The tar and its crude distillation products have value, but in the present state of the art of refining and under present market conditions to assign a high value to the by-products or to attempt to refine the crude by-products is not advisable.

A potential market exists in the United States for carbonized lignite, and it should be developed. This fuel is excellent for producer-gas generators or on suitable, especially provided grates, either as boiler furnace or domestic fuel. A suitable grate for burning the char in domestic heaters has been developed by the Bureau of Mines.

A further market for char or partly carbonized lignite lies in its use in the powdered form in pulverized-fuel burners. It should be a very satisfactory fuel for use in cement kilns.

For domestic use briquetted lignite char is comparable with anthracite coal in heating value and convenience in handling. Some smoke is usually evolved during the period immediately following the charging of briquets into the fire, but in the main the briquetted char burns much like anthracite coal and can be stored like the latter. Its use as a domestic and an industrial fuel is increasing yearly; it can be burned on suitable grates with fairly high thermal efficiency.

No commercial plants manufacturing char or briquets for fuel exist in the United States at the present time.

The results of these studies are contained in Bulletin 255, copies of which may be obtained from the Bureau of Mines, Washington, D. C.

Mining Stock Investigation

The California state corporation department has announced that it has started an investigation of the mailing of mining stock certificates through the mails with the request that the recipient remit.

Clifford J. MacMillan, state corporation commissioner, ordered the inquiry when a certificate for 1,000 shares of the Nevarical Mining Syndicate was submitted to the department by a person who said he had received it in the mail together with a glowingly worded prospectus and a letter requesting a remittance of $100.

The department, it was stated, has not been able to determine how widespread has been the distribution of the certificates in California, but took the position the offering of the stock was a violation of the state's blue sky law, as the company, incorporated in Nevada, has no permit to dispose of its securities in this state.

According to the company's letter transmitting the stock certificate the reason for mailing the stock and trusting to the recipient to remit was in order to avoid delay in getting the certificate into the possession of the prospective purchaser.

Rehearing Denied in Idaho Copper Corp. Libel Suit

Judge F. S. Dietrich, Boise, Idaho, has denied the motion of Idaho Copper Corp. for a new trial of its libel suit against Stewart Campbell, inspector of mines of Idaho, for $500,000 damages, which was decided in favor of the defendant.

In denying the motion for a rehearing, which Judge Dietrich viewed as being based upon an after-thought technicality, the Judge said in part: Idaho Copper Corp.'s "principal insistence is upon the contention that the court erred in declining to give a requested instruction substantially to the effect that, upon the admissions of the defendant, plaintiff was entitled to a verdict for at least nominal damages, because of a statement made in the telegram that plaintiff had not complied with the laws of Idaho, and in one of the letters to the effect that it had not complied with the Blue Sky Law, the argument being that failure to comply with the Blue Sky Law is by the Idaho statutes declared to be a criminal offense, and that an unwarranted charge of such failure constitutes liber *per se*."

The judge said that undoubtedly these statements in the telegram and letter were regarded by the plaintiff as only of incidental importance, its real grievance being the charges made by the defendant that it was promoting sale of its mining stock by means of extravagant and misleading statements constituting actual fraud.

MONTANA LEASE QUESTION

A furore has been created in the Montana oil fields by recent decision of the State Attorney General that leases on state owned lands are not subject to renewal at their expiration says the Wall Street Journal.

In the West, the national government deeded the states lands that were to be owned by the states to do as the legislatures wished. As Montana oil fields developed many state tracts were leased and drilled. Under the ruling no matter how much has been expended by the oil operator for development he must abandon the property unless he chooses to outbid any competitors. A test case will be tried to determine the correctness of the ruling. Leases on privately owned tracts and also on Federal lands provide that the oil operator has a right to renew his lease at its expiration, in preference to any other.

Attorney General also recommends that the state take its royalty oil, instead of selling it to the refining companies, and build a refinery to refine this crude. He holds the state could sell gasoline at 13 cents a gallon and points out gasoline made from Montana crude sells in Nebraska for less than in Montana, due to competitive conditions in Nebraska.

Judge Dietrich said that the Idaho Copper Corp. during course of the trial had tacitly admitted that it had done nothing to comply with the Blue Sky law and the controversy between the parties was not as to the facts, but as to the scope of the statutes.

The Judge refused to see that the defendant's statement upon this matter constituted libel *per se*, as it did not in his view involve a charge of moral obliquity. "The charge, if untrue, that in the sale of its stock it was acting in bad faith and was wilfully deceiving the public constituted the real ground for grievance. * * * In summing up his argument to the jury, senior counsel for the plaintiff said: 'We don't ask to punish him; we don't ask for large damages. That isn't what we are here for. We ask to have from your hands a vindication of that foul charge that we are swindlers.'"

The Judge concluded by saying that "upon this, the real issue upon which plaintiff thus earnestly asked for an unequivocal finding, the jury decided squarely against it," and that to have given the instruction the plaintiff requested would not only have prevented the jury from ruling upon what the plaintiff "thus professed to ask for, and the only thing it asked for," but such instruction to the jury would have "imposed upon the jury the duty of finding for the plaintiff generally."

Royalty Basis Case Goes to Supreme Court

By decision of the Schuylkill County Court sitting in bank, the decree of Judge Koch in the case of the City of Philadelphia, trustee under the will of Stephen Girard, against the Lehigh Valley Coal Co., was affirmed in favor of the coal company, and information from Fottsville is to the effect that an appeal to the Supreme Court will be taken.

This was a case involving the basis of payment for royalties, and the argument was made late in October, 1926. The facts are: In 1913 the Girard Estate made nine leases to as many lessees, the Lehigh Valley being one. It was stipulated that the royalties should be based on the mine selling prices, with no allowance for costs of storing, selling or marketing. It was further stipulated that if any lessee sold to concerns in which such lessee had a financial interest, such sales should not be considered in arriving at average mine sales prices.

At that time, the Lehigh Valley Coal Co. and the Lehigh Valley Coal Sales Co. were in close association, and had an exclusive buying and selling arrangement. The sales of the Coal Company to the Sales Company were therefore excluded under the agreement. But in 1920, by decree of the Federal Courts, the Lehigh Valley properties were segregated, and the exclusive contract between the Coal Company and the Sales Company was abrogated by court direction.

The Lehigh Valley Coal Co., in effect, holds that it is now in law and in fact distinct from the Lehigh Valley Coal Sales Co., and that its actual prices received for coal at the mines, though the bulk of the selling is still done to the Coal Sales Co., should govern in determining royalties. The Girard Estate, in effect, holds that however much the two companies are now distinct in law, they are a unit in fact and that their common interest, or community of interest, brings them within the scope of the original terms of the lease; in other words, that the Coal Co. should pay royalties on the prices received by the Coal Sales Co.—that is, the mine price plus the selling, storing and other marketing costs.

Judge Koch, who heard the original case, delivered the opinion of the court, sustaining the original findings in favor of the coal company and making the necessary orders to carry those findings into effect. Judge Berger dissented, saying that he differed materially with every conclusion reached by the other members of the court.

The Girard Estate appeal, if taken, will make the second important appeal involving coal matters to go to the Supreme Court this year from the lower coal field. The Gilberton School District, which recently lost an action to recover alleged taxes from the Gilbert Estate, is also preparing to carry its case to the highest court.

Bunker Coal

Effective January 1, 1927, ships bunkering at Montreal and other Canadian ports east must pay a duty of 50 cents per ton on bituminous imported from the United States. This regulation gives Canadian mines protection on bunker coal in eastern Canadian ports, as the duty-free privilege will remain in force west of Montreal. Bituminous is dutiable at 50 cents per short-ton but duty-free entry of bunker coal has heretofore been permitted at all Canadian ports.

CURRENT OIL SHALE BIBLIOGRAPHY

Alderson, Victor C.—Oil Shale, Journal of the Institution of Petroleum Technologists, London, August, 1926, pp. 366-374.

California Shale Oil Industry Advances, California Oil World, December 9, 1926, p. 12.

Oil Shale Industry Is Now Attracting Wide Attention, Salt Lake Review, October 30, 1926, pp. 13-14.

Big Companies Have Entrenched Themselves for Shale Development, California Oil World, November 11, 1926, p. 2; November 18, 1926, p. 7.

Baxter, Robert A.—The Probable Future Utilization of Oil Shale, Mountain States Mineral Age, November, 1926, pp. 23-27.

Flynn, A. E.—Investigations on the Treatment of Nova Scotia Oil Shales, The National Research Council, Ottawa, Canada, 1926.

Gavin, M. J.—Results at Government Oil Shale Testing Plant, Mining and Metallurgy, November, 1926, pp. 480-482.

Ginet, J. H.—Colorado Can Supply the World With Oil From Its Vast Oil Shale Deposits, Mountain States Mineral Age, September, 1926, pp. 35, 37.

Government Oil Shale Plant to Close Without Having Done Much, Salt Lake Mining Review, December 15, 1926, pp. 19-20.

Index Shale Oil Company, Mountain States Mineral Age, October, 1926, pp. 19-20.

Karrick, Lewis C.—Manual of Testing Methods for Oil Shale and Shale Oil, U. S. Bureau of Mines Bulletin, Washington, D. C., p. 249.

Kogerman, P. N.—The Production of Oil Shale and Shale Oil in Estonia, Journal of the Institution of Petroleum Technologists, London, August, 1926, pp. 431-435.

Morrell, J. C. and Egloff, Gustav.—Anti-knock Motor Fuels by Cracking Shale Oils, Industrial and Eng. Chemistry, August, 1926, pp. 801-802.

New Methods, Tests, and Results in Oil Shale Related, Salt Lake Mining Review, November 15, 1926, pp. 20-21.

New Type Lead Jacket Retort, Mountain States Mineral Age, November, 1926, pp. 21-22.

Oil Shale in the United States, South African Min. and Eng. Journal, October 16, 1926, p. 176.

Simpson, D.—Oil Shale Retorts, Petroleum Times, London, November 20, 1926, p. 905.

Simpson, Louis—Cost of Oil Shale, Mining Journal, London, December 4, 1926, p. 988.

Winchester, Dean E.—Government Oil Shale Plant Visited by Prominent Geologists and Mining Engineers, Mountain States Mineral Age, October, 1926, pp. 17-18.

White, David, and Stadnishenko, Taisia—Microthermal Observations of Some Oil Shales and Other Carbonaceous Rocks, Bulletin of the American Association of Pet. Tech., September, 1926, pp. 860-870.

Composition of Materials from Various Elevations in an Iron Blast Furnace

An investigation of the gas composition, temperature, and pressure at a series of planes in a blast furnace making foundry iron in the southern district was recently completed by the Bureau of Mines. Samples of coke, metal, slag, limestone, and stock were recovered from points between the tuyere plane and stock line. If complete and representative samples of stock could be obtained from various points across a series of planes between the stock line and tuyere level while the furnace is in operation, analyses of these samples would present a clear picture of most of the steps in the reduction process. Aside from giving the position of the zones of reduction, calcination, and slag formation, the samples would be valuable in determining where the iron acquires its carbon, sulphur, phosphorus, manganese, and silicon. Such an investigation was suggested by a number of operators who are interested in control of the composition of pig iron.

The results of this investigation are given in Bureau of Mines' Technical Paper 397, by S. P. Kinney, metallurgist, which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a price of 5 cents.

Charging Explosives in Drill Holes of Drift Rounds in Metal Mines

In cooperation with the mining companies of the southwest the Bureau of Mines is conducting an investigation to ascertain the safest and most economical explosives to use in metal mines, and to determine the best methods of blasting under various conditions.

A part of this investigation has been a study of drilling and blasting drift rounds in metal mines. The methods of loading the individual holes of drift rounds are discussed in Serial 2789, by E. D. Gardner, district mining engineer.

For safety and efficiency in blasting drift rounds the bureau makes the following suggestions:

It is not economy to use cheap fuse, detonators, or electric delay detonators.

All fuse for use in the mine should be "capped" at a central point by a well-qualified man with proper tools for the purpose. Capped fuse should be taken underground in closed, rigid containers and kept in lockers separate from the explosive. Capped fuse should be issued separately from the explosive and carried in separate bags to the working places. Fuse used in wet work should be waterproofed at the junction with the detonators.

Primers should be made in such a manner that the detonators will not be pulled from the primer cartridges, either in loading or by the action of the detonation of preceding charges. Primers should be made in such a manner that the fuse will not be kinked or bent sufficiently to cut the train of fire in the powder core after the hole is loaded. The primer should be placed deeply enough in the holes that when fuse is used the train of fire in the fuse is within the solid rock before the first hole of the round detonates.

Where there is danger of overbreak from any hole, the primers of the other holes should be deep enough that they will not be cut off and become mixed with the blasted material.

Charges should be well tamped.

The use of care and forethought in loading will prevent cartridges becoming jammed in drill holes. Stemming increases the efficiency of the explosive and reduces the amount of poisonous gases produced in the gases from blasting.

Drill holes of drift rounds should not be loaded with explosive to the collar.

In order to insure the proper rotation of firing with fuse and detonators, the difference in length of fuse between the successive holes should be as great as practicable. The shortest fuse in the round should always be long enough to give the men ample time to reach a place of safety.

Rounds fired electrically with a blasting machine should be wired in series and rounds fired from an electric circuit should be wired in multiple. Blasting accidents are less likely to occur with electric blasting than blasting with fuse and detonator.

Faces in which misfires occur should not be approached within one hour of when the round was fired with fuse and detonators, or one-half hour if fired electrically.

Missed charges should be reblasted by reinserting a fresh primer above the explosive before any work is done in a face in which misfires occur.

Copies of Serial 2789 may be obtained from the Bureau of Mines, Department of Commerce, Washington, D. C.

ACCIDENTS IN QUARRY MINES IN 1925

Bureau Of Mines Releases Statistics Showing Death Rate Of 1.78 Per Thousand Men Employed As Compared With 1.63 For Preceding Year

THE stone-quarrying industry of the United States employed 91,872 men in 1925, of whom 52,224 worked inside the quarry pits and 39,648 worked at outside plants on such work as stone crushing, rockdressing, manufacture of lime or cement, etc., states the Bureau of Mines in a review of reports received from operators of quarries covering accidents and employment in that calendar year. Accidents to the employes resulted in the death of 101 men in the quarry pits and 48 men at the outside plants. The death rate for the industry as a whole was 1.78 per thousand men employed (calculated on a standard of 300-workdays per man), as compared with 1.63 for the preceding year. Accidents to men working inside the quarry pits resulted in a fatality rate of 2.28 as against 1.90 in 1924. For crushing and other outside plants the rate was 1.22 as against 1.24 in 1924.

Of the 101 fatalities among the men working inside the quarries, 34 were caused by falls or slides of rock or overburden, 20 by explosives, 13 by machinery, 11 by haulage equipment, 8 by falls of persons, and 15 by various other causes such as handling rock, flying rock, electricity, etc. The principal causes of fatalities at the outside plants were machinery, haulage, falls of persons, burns, electricity and falling objects.

The reports of injuries that did not result fatally included all accidents that incapacitated an employe beyond the day on which the accident occurred. Among the employes inside the quarries 8,722 men were thus injured, representing a rate of 197 injuries per thousand men employed, as compared with 178 in 1924, an increase of about 11 percent. The main causes of these accidents and the number of men injured by them were: 1,639 by handling rock, 1,267 by flying objects, 912 by haulage, 846 by falls or slides of rock or overburden, 764 by machinery, 462 by falling objects, 436 by drilling and channeling, 410 by falls of persons, 335 by timber or hand tools, and the remainder (less than 300 in each case) by explosives, nails and splinters, burns, electricity, and boiler and air tank explosions.

Nonfatal injuries among employes engaged in stone crushing, rockdressing, and other work outside the quarries numbered 5,533, indicating an injury rate of 141 for this group of workers as compared with 171 in 1924, a reduction of about 17 percent. The principal causes of these accidents and the number of persons injured from each cause were as follows: 1,099 by flying objects, 638 by machinery, 568 by falling objects, 471 by falls of persons, 468 by hand tools, 433 by haulage, 397 by handling rock, 280 by burns, 215 by nails and splinters, 81 by electricity, and the remainder by miscellaneous causes.

The total number of accidents of all kinds during the year was 14,404. Of this number 149 accidents resulted in the death of the injured men, 22 caused permanent total disability, 430 caused permanent partial disability, 2,627 caused temporary disability lasting more than 14 days, and 11,176 caused temporary disability exceeding the remainder of the day of accident but not exceeding 14 days. These deaths and injuries combined, when weighted according to standard methods, represent a loss of time estimated at 1,493,000 man-days, a loss of time equal to about 6 percent of the total number of man-days worked by all employes during the year. In 1924 the deaths and injuries represented a loss of 1,399,000 man-days or 5½ percent of the total man-days worked.

Persons employed at quarries in Pennsylvania outnumbered those employed in any other state. The reports for Pennsylvania showed 18,138 men employed in 1925. Ohio ranked second with 6,620 men. California reported 6,075, Indiana 5,457, Illinois 4,872, Vermont 4,603, and New York 4,390. Other states having as many as 2,000 men employed at quarries were Missouri 3,501, Georgia 2,862, Massachusetts 2,635, Virginia 2,281, Tennessee 2,256, Michigan 2,191, and Wisconsin 2,031.

Safer Conditions in Metallurgical Industry in 1925

Increased employment and a better safety record in 1925 in the metallurgical industry in the United States were indicated by reports from operating companies to the Bureau of Mines. The industry as a whole employed 58,935 men, or 2,739 more than in 1924. The death rate from accidents at the plants was reduced from 0.87 per thousand employes in 1924 to 0.66 per thousand in 1925 and the injury rate per thousand employes was reduced from 131 to 116. These injury rates include all accidents serious enough to disable a workman beyond the remainder of the day on which the accident occurred.

The accident reports were grouped into three classes: 1, those for ore-dressing plants; 2, those for smelting plants (exclusive of the steel industry); and 3, those for auxiliary works, including yards, shops, and construction work. The records for ore-dressing plants alone showed a reduction in the fatality rate from 1.24 per thousand employes in 1924 to 1.00 per thousand in 1925. The non-fatal injury rate per thousand employes was lowered from 156 to 131. The injury rate for smelters was 113, the same as in the previous year, but the fatality rate increased from 0.55 to 0.63. While this fatality rate for 1925 was higher than in 1924, it was lower than in any other previous year for which records are available; that is, it was lower than since 1913 when accident reports for smelting plants were first collected by the Bureau of Mines. The fatality rate for auxiliary works reached a new low record, with the exception of 1919. Only eight men were killed in 1925, the fatality rate per thousand employes being only 0.41 as compared with 1.08 in 1924 and 0.31 in 1919.

Ore-dressing plants employed 16,945 men in 1925, about 1,200 more than in 1924. The volume of employment was equal to 5,124,733 man-days, an average of 302 workdays per man, or 5 days less per man than in the preceding year. Smelting plants employed 25,144 men, or 203 more than in 1924. A total of 8,980,514 man-days was worked, representing an average of 357 workdays per man, 5 days more per man than in 1924. The number of employes at auxiliary works was 16,846, an increase of 1,326 over the previous year. The number of man-days worked was 5,843,923, indicating an average of 347 workdays per man during the year, or 6 days more per man than in 1924.

The total number of accidents of all classes at ore-dressing plants was 2,232, and of these the principal causes were falls of persons, falling objects, machinery other than tables or jigs, hand tools, nails and splinters, flying pieces of rock from sledging or crushing, and crushers, rolls, or stamps. The records for smelting plants showed that the main causes of accidents were burns from matte, slag, or molten metal, flying or falling objects, hand tools, falls of persons, haulage, and machinery other than cranes. At auxiliary works the accidents were caused mainly by falling objects, hand tools, falls of persons, nails and splinters, and machinery.

Of the 7,755 deaths and personal injuries during the year, 44 resulted in the death of the injured employes, 5 caused permanent total disability, 226 caused permanent partial disability, 1,902 caused temporary disability lasting more than 14 days, and 5,578 caused temporary disability lasting more than the remainder of the day or shift on which the accident occurred but not more than 14 days.

Hazard of Missed Holes

Drilling or picking into missed holes is one of the most frequent causes of blasting accidents in metal mines, states E. D. Gardner, mining engineer, Bureau of Mines, in a recently issued publication. When it is known that a face contains an unexploded charge the hazard is greatly reduced, as before anyone does any other work at the face the missed hole can be reblasted by placing a new primer above the charge.

To count the detonation of shots in rounds and to report the missed holes is an almost universal practice. Occasionally, as in a large stope where a number of rounds are shot together, it is not practicable or possible to count the individual shots.

Where "V"-cut rounds are used, two or more charges often explode together and in consequence there is doubt as to whether any mis-fires have occurred. Under these conditions miners are more likely to pick or drill into missed holes in cleaning out the broken material.

Missed holes in drift rounds are usually easy to detect by an inspection of the face, and are generally identified by the fuse sticking from the hole. Missed lifters in drift rounds are sometimes not made evident by an inspection, and for this reason are more dangerous. Most miners load the lifters heavily so that the broken rock will be thrown back from the face on a shoveling sheet; this makes the detection of a misfire in a lifter easier. Missed holes in shafts or in underhand stopes are more hazardous than those in drifts because the unexploded charges are harder to find.

Safety Award

The Federal Mining and Smelting Co. in the Joplin-Miami Zinc and Lead district believes it has established the world's record in safe mine operation at its Muncie mine. On December 15, 1926, this mine had operated since July 23, 1925, without a single lost-time accident. The average number of men employed at the property at this time has been 80. P. W. George is general superintendent, T. D. McNeely is safety engineer, and D. Downing is ground foreman at this mine. This mine also won the first prize in the safety contest in the Miami district for 1926.

Colorado First Aid

"What to do in case of disaster" is the basis for advanced first aid training to be given to the officials of the coal companies in and around Trinidad, Colo. This training will include general superintendents, down to fire bosses and will study both mine rescue, first aid, and preventive measures.

ACCIDENTS AT METAL MINES AND NON-METALLIC MINES IN 1925

As Compared With 1924 Industry Showed Larger Number Of Employes And Man-Days Of Labor Performed With Reduction In Death Rate

A TOTAL of 126,713 men were employed at metal mines and nonmetallic mines in the United States (except coal mines and stone quarries) in 1925, according to reports received by the Bureau of Mines from operating companies throughout the country. This represents an increase of 3,585 over the number employed in the preceding year. These men worked 37,172,359 man shifts, an average of 293 workdays per man, as compared with 35,734,008 man-shifts and 290 workdays per man in 1924. Each of the larger branches of the industry except iron mines showed an increase in the number of employes. Iron mines employed about 2,000 men less than in 1924, but the reduction was about counterbalanced by an increase in the average working time per man from 269 days in 1924 to 275 days in 1925.

As compared with 1924 the industry showed a slightly larger number of employes, a larger number of man-days of labor performed, and an increase in the number of workdays per man. The records also showed a reduction in the death rate for the industry as a whole and a slight increase, though too small to be significant, in the nonfatal-injury rate. The returns covered all injuries that disabled an employe beyond the remainder of the day on which the accident occurred.

The combined fatality rate for all classes of mines covered by the figures was 2.99 per thousand employes (calculated on a standard year of 300 workdays) as against 3.51 in the year before. A large part of the reduction in the death rate was due to the fact that in 1924 a single disaster resulted in the loss of 41 lives whereas in 1925 the industry did not suffer any large disasters. The fatality rates for all of the major groups of mines, except the lead and zinc mines in the Mississippi Valley States, were lower in 1925 than 1924. The rate for the lead and zinc group increased from 2.76 to 3.32 per thousand employes. The rate for copper mines was lowered from 3.55 to 2.94; that for iron mines, from 2.95 to 2.54; that for nonmetallic mineral mines, from 1.94 to 1.71. The rate for the gold, silver and miscellaneous metal group of mines, the group which includes mines producing manganiferous iron ore, quicksilver, bauxite, etc., was 4.99 in 1924 (including the disaster in which 41 lives were lost) as compared with 3.83 in 1925.

Of the total number of accidents at all mines, 371 were fatal, 21 caused permanent total disability, 653 caused permanent partial disability, 8,163 caused injury of a temporary nature disabling the employes for more than 14 days, and 26,295 caused temporary disability exceeding the remainder of the day of the accident but not exceeding 14 days.

The principal causes of accidents that resulted in death were falls of rock from roof or wall, explosives, haulage, and persons falling down chutes, winzes, raises, or stopes. Of the total number of deaths, 273 were from accidents under ground, 39 in shafts, 25 in open-pit mines, and 34 in surface shops and yards.

Safe Storage of Explosives

The method of construction of magazines for explosives and the situation of magazines in relation to other structures, roads, or workings, is governed by law in many states, says the Bureau of Mines in Technical Paper 400. Where there is a choice of location, storage magazines should be built at such a place that the explosive need be handled but a minimum number of times in order to bring it to the mine entrance. As the explosives usually deteriorate with age, whenever it is practicable not more than a 30 days' supply of explosives should be contained in a storage magazine at any one time.

Fresh supplies of explosives should be so placed in magazines that the old stock may be used first. All of any particular class and grade of explosive on hand in a magazine when the supply is replenished should be used before any of that in the new lots. Cases of any dynamites other than gelatins should be so piled that the cartridges lie horizontally, in order to lessen the possibility of leakage of nitroglycerine from the explosive. Gelatin dynamite may be piled in any position. Only low-freezing explosives should be used in cold weather. No frozen explosives should be sent underground or used in any circumstances. Bureau of Mines Technical Paper 18, Magazines and Thaw Houses for Explosives, gives recommendations on the construction of thaw houses and on thawing frozen explosives. Copies of Technical Paper 18 and Technical Paper 400 may be obtained from the Bureau of Mines, Department of Commerce, Washington, D. C.

NEW COAL BLASTING PROCESS INVENTED

ACCORDING to a news item in a current issue of Black Diamond, the J. K. Deering Coal Co. has been conducting satisfactory experiments with a new coal blasting process for the purpose of reducing the percentage of screenings. In part they say:

"The new system of breaking down coal from the mine face by means of steel cartridges containing condensed carbon dioxide gas, was conceived and worked out by members of the Safety Pressure Mining & Equipment Co., of Harrisburg, Ill.

"Arthur W. Helmholtz, chemical engineer, is the president of the Safety Pressure Mining & Equipment Co., J. H. Crawford, mine operator, is vice-president and Dent Ferrell, electrical engineer, is the secretary and treasurer. The company has signed a contract with the J. K. Deering Co. which covers the entire production of its mines by use of the condensed gas cartridges for a period of time sufficient to prove conclusively whether or not the new idea is commercial in all of its details. Trials with the new blasting system have been carried on in the Eldorado mine and others in southern Illinois for several months with success, but the installation being applied in the Eldorado mine now, is one of the first covering large tonnage and all the conditions that occur in regular mining operations every day over an extensive period of time.

"According to declarations made by James B. Pauley, president of the Deering Co., the past trials have shown to his satisfaction that the system has been worked out to a point covering all of the essential principles and that only details of lesser importance may require further adjustment. He stated that he has personally witnessed many of the results and that he is convinced of the system's possibilities. He explained that one of the main appeals of the condensed carbon dioxide gas cartridge is the protection it affords the miners against the ignition of inflammable gases in mines. He said that the force of the gas release can be so regulated as to greatly reduce the shattering effect on the coal if this is desired. The gas is released from the steel cartridge by the blowing out of an iron disc at one end through pressure caused by expanding the gas in the cartridge by means of an electric heating connection. The pressure required to blow out the disc is regulated by the thickness of the disc. If high pressure is desired, a heavy disc is used to stop the end of the steel cartridge. If lower pressure is preferred, a thinner disc is used. The steel tube of the cartridge is in no way injured by the gas release and is available for use repeatedly, being in fact a regular piece of mine equipment, ready for recharging as soon as the coal face is broken down.

"By limiting the pressure and directing the direction of the gas release, the coal is broken down nearly all in large lumps. If finer coal is desired, the gas is released under higher pressure, when the expansion is made more violent. In the preliminary experiments these pressures have been varied at will from ten thousand to eighteen thousand pounds per square inch. The charging of the cartridges is accomplished under a pressure of about 2,000 pounds per inch.

"Mr. Pauley exhibited two or three discs that had been blown out of the cartridges during recent applications of the system. The metal was cut with a clean edge as though with a sharp tool, showing the tremendous force of the gas pressure as it pushed the disc through the shearing ring when the heat is applied.

"Another safety factor which has been demonstrated in the results up to now, is the reduction of roof troubles which the moderated gas release permits. The cartridge discharge does not produce the sharp percussion that is one of the characteristics of the ordinary powder explosion. Mr. Ferrell compared the two by saying that a powder explosion has the effect of a blow struck by a hammer while the gas release exerts a pressure equal to that created by the powder explosion but without the sharpness of the hammer blow. He declared that the coal could be broken down with the gas cartridge while the miners are standing a few feet away from the face without danger. He said that there is nothing poisonous in the gas released from the cartridge and that no spark or flame is generated to ignite whatever gases or coal dust there may be in the mines where it is in use.

"The originators of the new system said they anticipated no opposition to the use of the carbon dioxide cartridge on the part of the miners' union, but that on the contrary there is every reason to expect the union's approval and wholehearted assistance in developing its general use if for no other reason than the safety which it insures in the mines. No claim is made for the new system concerning the reduction of the cost of mining, but it is believed that by reducing the amount of screenings produced, better average market return will be achieved. Neither is the new process considered a 'labor-saving device' as far as number of men employed is concerned, although it is believed that certain conditions due to the use of other explosives now in practice will be eliminated.

"Owing to the fact that it is the larger sized coal that goes over the picking tables and that screenings is the part which is harder to clean, the reduction of screenings or finer coal by the new process, is expected to result in generally cleaner product.

"It is expected that definite results of the Deering mines installations may be announced in the near future."

FACTORS AFFECTING THE SAFETY OF EXPLOSIVES

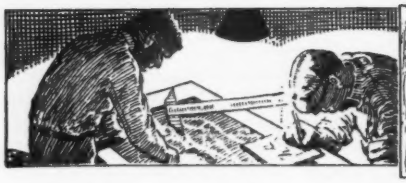
To the end that yet safer explosives and blasting methods may be developed, the Bureau of Mines is investigating the factors which affect the liability of an explosive to cause ignition of gas or coal dust. The effect of chemical composition, physical characteristics, and explosive properties of the explosives themselves, as well as the methods of loading them in the borehole, are being investigated in a testing gallery from this point of view. It has been shown that for explosives of identical chemical composition, those having higher rates of detonation are more likely to ignite gas. Wet fireclay stemming or fine rock dust stemming are safer than dry fireclay. Coal dust stemming has been shown to be more dangerous than no stemming at all. The relation between limit charge and gas concentration has been studied and the lower limit of inflammability of natural gas to ignition by explosives has been determined.

Coal Mine Safety Urged

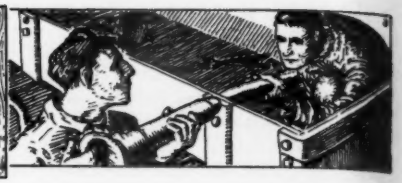
Daniel Harrington, Chief Engineer, Mine Safety Division, U. S. Bureau of Mines, in an address before the 20th Annual meeting of the American Association of Labor Legislation recently held at St. Louis, recommended the installation of permissible mining machinery of all kinds, closed lights and surface fans for ventilation. He also recommended that shotfirers, firebosses, foremen and superintendents be required to have a certificate of competency after having passed an examination as to knowledge in up-to-date practice as to safety in coal mines.

Important Strike at Tonopah

New ore developments in the Tonopah Extension, West End and Rescue Eula mines at Tonopah, Nev. indicate that 1927 may witness a pronounced revival of mining in that district. John G. Kirchen, General Manager of the Tonopah Extension, has confirmed reports that a crosscut from the 1540 foot level in the McKane workings has opened a nine foot vein of $40 ore.



WITH THE MANUFACTURERS



A New Milburn Torch for Cutting Metals

The cutting of heavy plates, risers, gates, billets, etc., with ordinary 4-inch water column pressure, ounces pressure or pounds pressure using either city gas, natural gas or by-product (coke oven) gas has been made possible by the development of the Milburn oxy-illuminating gas cutting torch, type LPG.

The torch is made of bronze forgings and special seamless tubing, constructed to withstand constant and severe service. It is evenly balanced and ruggedly built. The high pressure cutting oxygen is controlled by a thumb valve which remains fixed in either open or closed position. The arrangement of the gas tubes gives the torch great transverse strength.

The torch is supplied with a range of tips to accommodate all thicknesses of metal. The tips are made of solid copper, designed to rapidly preheat the gases, giving better penetration and quicker cutting.

Information and literature on this new process can be obtained by writing to its manufacturer, the Alexander Milburn Co., 1416-1428 West Baltimore Street, Baltimore, Md.

Beaumont Improves Skip Hoists

A release from the American Cable Co., says:

"It is obvious that upon the service afforded by wire rope depends the efficiency of skip hoists, drag line scrapers and other types of coal handling machinery. Any improvement made to the wire rope used on such equipment, therefore, must effect a corresponding improvement to the service and economical operation of the machine. Recognizing this, the R. H. Beaumont Co., Philadelphia, has adopted Tru-Lay brand preformed wire rope as standard equipment on all their various types of coal handling equipment.

"This change, it is felt, will not only increase the efficiency and lengthen the service of the equipment but will eliminate hazards to workmen, since Tru-Lay rope will not "fly" or "explode" when cut or broken, due to the fact that each wire and strand is preformed, then laid into a definite place, rather than being merely twisted into shape. In addition, Tru-Lay wire rope resists kinking and has practically no tendency to high strand—two features that permit of easier handling and more economical service."

A New High Standard of Quality in Nickel

The International Nickel Co. is announcing the production of a new grade of electrolytic nickel produced at their Port Colborne Works, Port Colborne, Ontario. It is being produced by the Stanley Process developed by Mr. R. C. Stanley, president of the International Nickel Co., but with certain modifications in the electrolytic operation. This new product will have a purity of 99.90 percent and will be the highest grade of nickel ever produced in quantity on a commercial basis by any company, in that it will be carbon and sulphur-free.

It is produced in the standard 27" x 36" cathode, weighing approximately 150 pounds, or will be cut into varying sizes of squares down to 1 inch as the trade requires, and in this form will be known as "Electro Squares." Present capacity for the production of this electrolytic nickel is approximately three-quarters of a million pounds per month and will be added to as the market requires.

According to announcement by the company, the development of this new material is a natural result of the policy of the company to strive constantly to improve the quality of its products. The high purity of electrolytic nickel and its freedom from carbon and sulphur make it particularly applicable to the special requirements of the producers of high nickel content alloys such as nickel-silver, copper-nickel, nickel chromium and ferro-nickel. Its development will not interfere in any way with the current and future production of the standard 99 percent nickel, which for years has been used in shot and ingot form with entire satisfaction in the production of low nickel content alloys and steels.

Foote Bros. Worm Gear Reducers

Foote Brothers Gear & Machine Co. has recently placed on the market a complete line of high grade, known as the "Hygrade," worm gear reducers of the anti-friction bearing type. They also announce that they have appointed the Progressive Machine and Engineering Corporation, 1335 E. Franklin St., Richmond, Va., as district representatives covering the State of Virginia, and the Banks-Miller Supply Co., of Huntington, W. Va., as district representative for the territory covering the vicinity of Huntington.

General Electric Orders for 1926

Orders received by the General Electric Co. for the year ending December 31, 1926, totaled $327,400,207, an increase of 8 percent, or nearly $25,000,000 over 1925, President Gerald Swope has announced. This is the biggest volume of orders in the company's history, the previous high mark, achieved in 1920, being $318,470,000, or about ten millions below the new record.

For the fourth quarter of 1926 orders booked amounted to $80,406,570, compared with $78,636,669 for the last quarter in 1925, a gain of 2 percent.

Sales billed and earnings for the year 1926 will be announced after the accounts are closed for the year and the annual report is published in March.

The action for $1,000,000 brought by Mr. P. A. E. Armstrong against the Ludlum Steel Co. for amounts claimed to be due him for a percentage of profits and royalties on patents assigned by him to the Ludlum Steel Co., has been decided by a decision handed down by Mr. I. Maurice Wormser, referee, on January 3, 1927, in which the referee finds that the Ludlum Steel Co. has paid Mr. Armstrong all monies due to him, which was approximately $20,000; overrules all the objections made by Mr. Armstrong; sustains in every particular the position of the Ludlum Steel Co., and dismisses Mr. Armstrong's complaint on the merits.

The Armstrong action was brought on the theory that the Ludlum Steel Co. was indebted to Mr. Armstrong for 50 percent of the gross amounts received by the company from the sale of material manufactured under the Armstrong patents to several large customers.

The company's contention was that under the contract Mr. Armstrong was entitled only to a percentage of the net profit the company conceding that it owed Mr. Armstrong a little over $20,000, which amount (while the action was pending) the company paid.

The company also filed with the referee a voluminous account, to which Mr. Armstrong filed over 200 typewritten pages of objections. Every one of these objections was overruled and the account, as filed by the company, was held to be true and accurate and the company's books were correctly kept and the company's interpretation of the contract with Mr. Armstrong was proper.

Link-Belt Shaker Shovel

The "Shaker Shovel," recently developed by the Link-Belt Co., Chicago, Ill., is a manual feeder for Link-Belt shaker conveyor.

It consists of a pair of steel troughs bent to the shape shown, the top trough having at its outer end a 4-ft. wide circular front shovel fitted with forged steel digging teeth. This upper trough is connected to the lower trough through a rack on the under side of the lower trough, which rack is engaged by a sprocket wheel connected to the steel bracket casting fastened to the upper trough, and this top trough section ratcheted forward or backward at the will of the operator, as he wishes to dig further into the coal or bring it back and move the shovel sideways to pick up some of the side coal advancing into it, as he wishes.

The lower trough is hinged at its inner end to the end of the standard shaker conveyor trough section by means of suitable forgings and trunnion fittings into the same connecting end plates as the regular trough sections are connected together by.

This shovel is primarily an entry driving machine, and in narrow work when driven to a depth of 100 feet or more, can be advanced much faster, and show a tremendous saving in loading costs, and it is here where this arrangement is almost indispensable when used with the shaker conveyor.

In an ordinary entry of coal 4 feet high or better, the shovel will easily pick up four-fifths of the coal, leaving perhaps a small amount around the sides to be shoveled.

Working three shifts, a single entry 8 feet wide, 6 feet high, has been advanced about 50 feet in 24 hours, which shows the possibilities of this new loading machine. This shaker shovel has had a practical tryout and several are on order for operating companies.

Reorganization of Westinghouse East Springfield Plant Engineering Department

A complete reorganization of the engineering department, to obtain a better concentration of engineering personnel and facilities at the East Springfield Works of the Westinghouse Electric & Manufacturing Co. has been announced by Mr. W. S. Rugg, vice-president in charge of engineering. Increasing growth and importance of the East Springfield plant has made this change necessary.

Mr. C. H. Garcelon, formerly manager of the small motor engineering of the East Pittsburgh Works has been appointed manager of engineering of the East Springfield Works. As manager he will have administrative charge of all engineering at this plant.

Mr. C. A. M. Weber has been appointed manager of the small motor engineering department, East Springfield Works.

Mr. E. W. Denman has been made section head in charge of the fan motor section of the small motor engineering department.

Mr. A. K. Phillippi will continue to act as resident engineer of the radio engineering department.

In the new plan of operation all fan motor and small motor engineering except that of farm lighter and locomotive headlighter work will be located at the East Springfield Works. The farm lighter and locomotive headlighter work will be retained at the East Pittsburgh Works under Mr. J. M. Hipple, present manager of motor engineering.

Announcement is also made by Mr. C. E. Allen, district manager, St. Louis office of the Westinghouse Co., that Mr. Graeme Ross has been appointed industrial division manager, St. Louis Office; Mr. B. W. Stemmerich, transportation division manager, St. Louis Office, and Mr. J. J. Thomason, central station division manager, St. Louis Office.

The Mine Safety Appliances Co., Pittsburgh, Pa., announces the appointment of Thomas Segrave as Boston representative, with headquarters at 30 Huntington Avenue, Room 230. Harry Segrave, a brother, is the New York representative.

Effective January 1, 1927, the name of the Armco Culvert & Flume Manufacturers' Association will be changed to Armco Culvert Association. This change of name does not imply any change in policy. The association will continue to devote its entire efforts to research in all matters relating to drainage and irrigation, and to educational publicity for making this research known to those whom it will benefit.

New Diamond Drill Catalog

Bulletin No. 80-B and No. 80-C, describing two new types of Sullivan Diamond Core Drills have just been issued by the Sullivan Machinery Co.

Bulletin No. 80-B describes Sullivan heavy duty, mounted type, diamond core drill, Class "N," driven by direct-connected Buda Engine and mounted on heavy truck with wide steel wheels for transportation in rough country. This machine, while it was designed particularly for deep structure testing in the oil fields, is also adaptable for a considerable range of mineral prospecting and engineering test boring work. Its portability and the absence of a boiler with the fuel required make it a compact rig and one easily moved from place to place in difficult country, where supplies are hard to haul. The "N" mounted rig has a capacity of 2000 feet in depth and removes a 2-inch core. The hydraulic cylinder is of a new heavy duty pattern and the drive rod is arranged to permit the use of large size fittings for fish tailing or mud bit work.

Catalog No. 80-C describes the new "Turbinair" diamond core drill, which is a hard metal prospecting machine with a rate of capacity of 800 feet in depth, removing 15/16-inch core. It may be mounted on either surface frame or on columns for use under ground. Sullivan screw feed with friction escapement is provided similar to that employed on the Sullivan "Beauty" diamond drill for many years a standard of value in hard rock prospecting. The motor is the well known "Turbinair" motor used in Sullivan portable hoists, coal cutters, etc. This motor will run on steam if desired. An electric motor may be substituted if the machine is to run on electric current.

Bethlehem Trade Bulletin

Bethlehem Steel Co. has issued a new catalog entitled "Mine and Industrial Track Equipment and Other Products," which is a complete catalog of Bethlehem standard equipment and contains such information as is necessary for ordering these products, together with tables and calculations of interest to users of light rail equipment.

Symons Bros. Cone Crushers

Symons Brothers Co., Chicago, Ill., have recently issued a beautiful catalog on the Symons Cone Crusher. In announcing the presentation to the trade of this crusher, they state that the object in building the Cone Crusher is to combine, in one machine, the advantages of both the Symons Horizontal and Vertical Disc crushers, thus giving in one piece of machinery the large ratio of reduction of the horizontal, the uniformity of product of the vertical, with the capacity of both. This crusher is said to introduce a new crushing process. It is equipped with manganese crushing members, and some of the features which they state will guarantee continuous service, are steel cut gears, high grade bronze bearings, manganese mantle and bowl liners, steel main frame, steel bowl, steel adjustment ring, and a ball thrust bearing to carry the weight of the eccentric. The catalog is beautifully illustrated with halftones, diagrams and tables. In announcing the new crushing process, they say:

"The gyration of the crushing head in the Cone Crusher is similar to that of the ordinary gyratory, with the exception that it moves at least five times as great a distance and gyrates faster. The action of the stone is entirely different. The rapid gyration and long movement drops the head from under the stone after each crushing impact and allows the stone to fall vertically away from the outer bowl. The number of gyrations of the head per minute regulates the distance the stone will travel between crushing impacts. Since the stone falls a certain distance between crushing impacts, the angle between the head and the outer bowl regulates the amount of reduction at each stroke. The lower part of the head and the lower part of the outer bowl are parallel for a sufficient distance to insure the head making one complete gyration before the material will drop the entire width of the zone. This means that the closed side of the crusher regulates the maximum size of the product. The long movement of the head creates a large opening on the discharge side for the free exit of the finished material which gives the crusher an exceptional capacity."

Copies of this catalog will be furnished upon request to Symons Brothers Co., 111 West Washington Street, Chicago, Ill.

General Electric Co. has issued a pamphlet on Centrifugal Air Compressors, small and multi-stage, and a pamphlet on G. E. Dynamo-Meters. Also a pamphlet on G. E. Automatic Welding Head and Control, all of which may be obtained upon request to their Schenectady office.

Light Contractors' Drill Sharpeners

Bulletin No. 72-I, second edition, issued by the Sullivan Machinery Co., of Chicago, describes in complete detail the Sullivan Class "C" light drill steel sharpening machine operated by compressed air. This machine was brought out during 1926.

The Class "C" sharpener is intended for making uniform and accurate bits and shanks for hammer drill service on ⅞-inch or 1-inch steel of any desired cross section. Either six-point rose or four-point cross bits are made rapidly and accurately on this machine and the collar shanks necessary are also made at one heat.

The Class "C" sharpener is also equipped to forge pick point bits and collar shanks on 1⅛-inch concrete breaker steel or to put shanks on steel spades used in the Sullivan "Spader."

The Class "C" sharpener weighs only 1,100 pounds and occupies a floor area of 2½ by 3½ feet, yet is sufficiently powerful and so well made that it does a real job for the contractor or quarryman or even for the smaller mine in keeping the owner's drill steel in perfect condition. All operations on the steel are performed by the Sullivan "All-Hammer" method at relatively low heat, so that the steel runs no danger of being burned or otherwise injured in the process of sharpening.

Southwestern Engineering Corporation, Los Angeles, Calif., has recently published a pamphlet entitled "Notes on the Flotation Process," written by Robert Lord and B. M. Snyder. In their foreword they state that "interest in flotation has increased rapidly in the last few years. This has been due to its successful application to complex ore problems, through the discovery of certain chemicals which retard or increase the flotability of minerals, and to improvement in flotation machines." Copies may be obtained upon request to the Los Angeles office.

Two new bulletins have just been published by The Electric Controller & Manufacturing Co. of Cleveland, Ohio. These are Bulletins 1037-C and 1042-F.

Bulletin 1037-C describes Type B Limit Stops for use with alternating and direct current motors. These limit stops are used on electric cranes and other motor driven machines which must be automatically stopped when reaching a given position.

Bulletin 1042-F describes E. C. & M. Automatic Compensators for 110 to 550 volts A. C. squirrel cage and synchronous motors.

These bulletins will be sent to anyone interested upon receipt of their request.

Chicago Steel & Wire Co. has issued a small booklet entitled "A New Viewpoint on Metallic Arc Welding Costs" which carries a vast amount of information upon this subject. Copies may be obtained from their Chicago, Ill., office, 103d Street and Torrence Avenue.

Deister Concentrator Co., Fort Wayne, Ind., has released a new bulletin on the Leahy No-Blind Screen, copies of which may be obtained upon request.

Roberts & Schafer Co., Engineers and Contractors, Wrigley Building, Chicago, Ill., has issued a circular on Rock Dusting and the Rotary Car Dumper, and states that for six years they have been developing equipment which would permit the use of solid-body dust-tight cars in mines, giving six major advantages acquired through the use of this equipment.

American Blower Co., Detroit, Mich., has issued a bulletin—No. 8001—on Fans and Blowers, which describes thoroughly their "Sirocco" fans and blowers. The bulletin carries a wealth of information upon this subject and is profusely illustrated.

De Laval Steam Turbine Co., Trenton, N. J., has issued a bulletin on mine pumps, especially designed for the practical operating miner, which contains a vast amount of information upon this subject. The bulletin is fully illustrated, and may be obtained upon request to either their New Jersey address, or to their representatives, Dravo-Doyle Co., Dravo Building, Pittsburgh, Pa.

TESTING EXPLOSIVES BY PHOGRAPHIC METHODS

An investigation to determine by photographic methods the effect of the physical and chemical properties of explosives on the flames produced, and the influence of different methods of loading and different kinds of stemming on the character of the flame, together with the relation of flame properties to the limit charge as determined in a testing gallery, is being conducted by the Bureau of Mines, at Pittsburgh, Pa.

Photographs on a rapidly moving film have shown that secondary flames are produced by most explosives when an air space exists between explosive and bore-hole or between explosive and stemming. Photographs on a fixed plate have shown coal-dust stemming to produce a large bright flame, much larger than with fire-clay stemming, and that addition of water to ordinary dry fire-clay stemming reduces size of flame. Results are in qualitative agreement with gallery tests.

BUYER'S DIRECTORY

ACETYLENE, Dissolved (Or in Cylinders)
Prest-O-Lite Co., Inc., 30 E. 42d St., N. Y. C.

ACETYLENE GAS
Prest-O-Lite Co., 30 East 42d St., New York City.

ACETYLENE GENERATING APPARATUS
Oxweld Acetylene Co., 30 E. 42d St., New York City.

ACID, SULPHURIC
Irvington Smelting & Refining Works, Irvington, N. J.

AERIAL TRAMWAYS
American Steel & Wire Co., Chicago and New York.
A. Leschen & Sons Rope Co., St. Louis, Mo.

AFTERCOOLERS (Air)
Ingersoll-Rand Co., New York City.

AIR COMPRESSORS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.

AIR HOSE COUPLINGS
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

ANNUNCIATOR WIRES & CABLES
John A. Roebling's Sons Co., Trenton, New Jersey.

ANNUNCIATOR WIRES & CABLES, INSULATED
American Steel & Wire Co., Chicago, Ill., and New York.

ARMATURE COILS & LEADS
John A. Roebling's Sons Co., Trenton, New Jersey.

AUTOMATIC CAR CAGES
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Roberts & Schaefer Co., Chicago, Ill.

AUTOMATIC CAR DUMPERS
Roberts & Schaefer Co., Chicago, Ill.

AUTOMATIC (Mine Doors, Truck and Electric Switches)
American Mine Door Co., Canton, Ohio.

AUTOMATIC SWITCH THROWERS
American Mine Door Co., Canton, Ohio.

AUTOMOBILE CABLES
John A. Roebling's Sons Co., Trenton, New Jersey.

BALLAST UNLOADER ROPES
John A. Roebling's Sons Co., Trenton, New Jersey.

BATTERIES (Storage, Gas Welding, Cutting, Dissolved Acetylene)
Prest-O-Lite Co., 30 East 42d St., New York City.

BELL CORD
John A. Roebling's Sons Co., Trenton, New Jersey.

BELTING (Conveyor, Elevator, Transmission)
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

BELTING, SILENT CHAIN
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

BINS (Coke and Coal)
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

BITS Carbon (Diamonds) for Core Drill
R. S. Patrick, Sellwood Building, Duluth, Minn.

BITS, Diamond Drilling
R. S. Patrick, Sellwood Building, Duluth, Minn.

BIT SHARPENERS
Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.

BLACK DIAMONDS
R. S. Patrick, Sellwood Building, Duluth, Minn.

BLASTING POWDER
Atlas Powder Co., Wilmington, Del.
E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.
Hercules Powder Co., 934 King St., Wilmington, Del.

BLASTING SUPPLIES
Atlas Powder Co., Wilmington, Del.
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Hercules Powder Co., 934 King St., Wilmington, Del.

BLOWERS, CENTRIFUGAL
Ingersoll-Rand Co., 11 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Robinson Ventilating Co., Zelienople, Pa.

BLOWERS (Tubing)
Robinson Ventilating Co., Zelienople, Pa.

BLOWERS (Turbine)
Robinson Ventilating Co., Zelienople, Pa.

BLOWPIPES, Brazing, Carbon Burning, Cutting, Lead Burning, Welding, Welding and Cutting
Oxweld Acetylene Co., 30 E. 42d St., New York City.

BLUE CENTER STEEL WIRE ROPE
John A. Roebling's Sons Co., Trenton, New Jersey.

BOND TERMINALS
Amer. Mine Door Co., Canton, Ohio.

BORTZ
R. S. Patrick, Sellwood Building, Duluth, Minn.

BREAKER MACHINERY
American Rheolaveur Corporation, Wilkes-Barre, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

BREAKERS (Construction and Machinery)
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

BREAST MACHINES
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

BRIQUETTING MACHINERY
Vulcan Iron Works, Wilkes-Barre, Pa.

BUCKETS (Elevator)
Hendrick Mfg. Co., Carbondale, Pa.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CABLE GREASE
Keystone Lubricating Co., Philadelphia, Pa.

CABLES
American Steel & Wire Co., Chicago and New York.
A. Leschen & Sons Rope Co., St. Louis, Mo.

CABLES (Connectors and Guides)
American Mine Door Co., Canton, Ohio.
Leschen & Sons Rope Co., A., St. Louis, Mo.

CABLES, INSULATED
John A. Roebling's Sons Co., Trenton, New Jersey.

CABLES, SUSPENSION BRIDGE
John A. Roebling's Sons Co., Trenton, New Jersey.

CABLEWAYS
American Steel & Wire Co., Chicago, Ill., and New York.
S. Flory Mfg. Co., Bangor, Pa.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

CAGE DUMPERS, ROTARY
Roberts & Schaefer Co., Chicago, Ill.

CAGE (Safety Appliances)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

CAGE STOPS & LOCKS
Mining Safety Device Co., Bowerston, Ohio.
Roberts & Schaefer Co., Chicago, Ill.

CAGERS, AUTOMATIC
Mining Safety Device Co., Bowerston, Ohio.

CAGERS, AUTOMATIC & MANUAL
Roberts & Schaefer Co., Chicago, Ill.

CAGES
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

CAGES (Self-dumping)
Roberts & Schaefer Co., Chicago, Ill.

CALCINERS
Vulcan Iron Works, Wilkes-Barre, Pa.

CARBON AND BORTZ
R. S. Patrick, Sellwood Building, Duluth, Minn.

CARBON FOR DIAMOND DRILLING
R. S. Patrick, Sellwood Building, Duluth, Minn.

CARBON BURNING APPARATUS
Oxweld Acetylene Co., 30 E. 42d St., New York City.

CARBON RODS AND PASTE FOR WELDING
Oxweld Acetylene Co., 30 E. 42d St., New York City.

CAR DUMPERS, GRAVITY & POWER
Roberts & Schaefer Co., Chicago, Ill.

CAR DUMPERS (Rotary)
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

CAR FEEDERS
Roberts & Schaefer Co., Chicago, Ill.

CAR HAULS
Goodman Mfg. Co., Halstead St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

CAR PULLERS
S. Flory Mfg. Co., Bangor, Pa.

CAR RETARDERS
Roberts & Schaefer Co., Chicago, Ill.

CAR STOPS, AUTOMATIC & MANUAL
Roberts & Schaefer Co., Chicago, Ill.

CAR WIRE & CABLES
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey.

CASTINGS
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CASTINGS, GRAY IRON
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.

CASTINGS, OPEN HEARTH STEEL
Vulcan Iron Works, Wilkes-Barre, Pa.

CHAINS
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

CHAINS, AUTOMOBILE ENGINE
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

CHAINS, COAL CUTTING
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

CHAINS, DRIVE
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

CHAINS, FRONT END
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

CHAINS, OILING
Morse Chain Co., Ithaca, N. Y.

CHAINS, POWER TRANSMISSION
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

CHAINS Silent (Bushed-Pin Joint)
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

CHAINS, SILENT (Rocker-Joint)
Morse Chain Co., Ithaca, N. Y.

CHAINS, SLING
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

CHAINS, SPROCKET WHEEL
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

CLAMPS, HOSE
Knox Mfg. Co., Philadelphia, Pa.

CLAMPS (Trolley)
Ohio Brass Co., Mansfield, Ohio.

CLAMPS, WIRE ROPE
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey

CLIPS, WIRE ROPE
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey

CLUTCHES
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

COAL CLEANING MACHINERY
American Rheolaveur Corporation, Wilkes-Barre, Pa.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

COAL COMPANIES
General Coal Company, Land Title Bldg., Philadelphia, Pa.
Lehigh Coal & Navigation Co., Philadelphia, Pa.
Thorne, Neale & Co., Philadelphia, Pa.

COAL CRUSHERS
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

COAL CRUSHERS & ROLLS
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.

COAL CUTTERS
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
Howells Mining Drill Co., Plymouth, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

COAL HANDLING MACHINERY
Conveyor Sales Co., Inc., 299 Broadway, New York City.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

COAL LOADERS
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

COAL MINING MACHINERY
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
Howells Mining Drill Co., Plymouth, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

COAL MINING PLANTS
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

COAL SEPARATORS (Pneumatic)
Roberts & Schaefer Co., Chicago, Ill.

COMPRESSORS, AIR
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.

COMPRESSORS, MINE CAR
Ingersoll-Rand Co., 11 Broadway, New York City.

CONCENTRATORS (Table)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

CONCRETE REINFORCEMENT
American Steel & Wire Co., Chicago, and New York.

CONDENSERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.

CONTROLLERS
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

CONVERTORS, COPPER
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

CONVEYORS
Conveyor Sales Co., Inc., 299 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

CONVEYOR BEARINGS
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

CONVEYORS, BELT
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CONVEYORS, CHAIN FLIGHT
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CONVEYORS, COAL
Conveyor Sales Co., Inc., 299 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-belt Co., 300 W. Pershing Rd., Chicago, Ill.

CONVEYORS AND ELEVATORS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Conveyor Sales Co., Inc., 299 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-belt Co., 300 W. Pershing Rd., Chicago, Ill.

CONVEYORS, PAN OR APRON
Conveyor Sales Co., Inc., 299 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CONVEYORS, SCREW
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-belt Co., 300 W. Pershing Rd., Chicago, Ill.

COOLERS, Man
Robinson Ventilating Co., Zelienople, Pa.

COOLERS, ROTARY
Vulcan Iron Works, Wilkes-Barre, Pa.

COPPER WIRE & STRAND (Bare)
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey

CORE DRILLS, Carbon (Diamonds) for
R. S. Patrick, Sellwood Building, Duluth, Minn.

CORE DRILLING
H. R. Ameling Prospecting Co., Rolla, Mo.
Hoffman Bros., Punxsutawney, Pa.
Mott Core Drilling Co., Huntington, W. Va.

COUPLINGS, FLEXIBLE
Fawcus Machine Co., Pittsburgh, Pa.

COUPLINGS, ROCK DRILL
Knox Mfg. Co., Philadelphia, Pa.

CROSSINGS AND CROSSOVERS
Central Frog & Switch Co., Cincinnati, Ohio.

CROSSOVERS
Sweet's Steel Co., Williamsport, Pa.

CRUSHERS
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

CRUSHERS, COAL
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CRUSHERS, SINGLE & DOUBLE ROLL
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CRUSHING PLANTS, COKE
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershig Rd., Chicago, Ill.

CUP GREASE
Keystone Lubricating Co., Philadelphia, Pa.

CUTTING APPARATUS, Oxy-Acetylene, Oxy-Hydrogen
Oxweld Acetylene Co., 30 E. 42d St., New York City.

DECARBONIZING APPARATUS
Oxweld Acetylene Co., 30 E. 42d St., New York City.

DESIGNERS OF PLANTS
American Rheolaveur Corporation, Wilkes-Barre, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

DIAMOND CORE DRILL CONTRACTING
H. R. Ameling Prospecting Co., Rolla, Mo.
Hoffman Bros., Punxsutawney, Pa.
Mott Core Drilling Co., Huntington, W. Va.

DIAMOND DRILLING CARBON
R. S. Patrick, Sellwood Building, Duluth, Minn.

DIAMONDS, BLACK (See Carbon and Bortz)
R. S. Patrick, Sellwood Building, Duluth, Minn.

DIAMONDS, INDUSTRIAL
R. S. Patrick, Sellwood Building, Duluth, Minn.

DIGGERS & PICKS, Pneumatic
Ingersoll-Rand Co., New York City.

DITCHING MACHINES
Keystone Churn Drill Co., Beaver Falls, Pa.

DOORS, AUTOMATIC MINE
American Mine Door Co., Canton, Ohio.

DOWNIE DEEP WELL PUMPS
Keystone Churn Drill Co., Beaver Falls, Pa.

DRIFTERS, DRILL
Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLING, DIAMONDS FOR
R. S. Patrick, Sellwood Building, Duluth, Minn.

DRILLS, AIR AND STEAM
Howells Mining Drill Co., Plymouth, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLS (Blast Hole)
Howells Mining Drill Co., Plymouth, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.
Keystone Churn Drill Co., Beaver Falls, Pa.

DRILL BITS, Carbon (Diamonds) for
R. S. Patrick, Sellwood Building, Duluth, Minn.

DRILL, Carbon (Diamonds) for
R. S. Patrick, Sellwood Building, Duluth, Minn.

DRILL COLUMNS & MOUNTINGS
Ingersoll-Rand Co., New York City.

DRILLER'S DIAMONDS
R. S. Patrick, Sellwood Building, Duluth, Minn.

DRILLS, CORE
H. R. Ameling Prospecting Co., Rolla, Mo.
Hoffman Bros., Punxsutawney, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.
Keystone Churn Drill Co., Beaver Falls, Pa.
Mott Core Drilling Co., Huntington, W. Va.

DRILLS, DIAMOND GASOLINE OUTFITS
Mott Core Drilling Co., Huntington, W. Va.

DRILLS, ELECTRIC
General Electric Co., Schenectady, N. Y.
Howells Mining Drill Co., Plymouth, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

DRILLS, HAMMER
Ingersoll-Rand Co., 11 Broadway, New York City.
Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

DRILLS (Hand Operated Coal)
Howells Mining Drill Co., Plymouth, Pa.
Ohio Brass Co., Mansfield, Ohio.

DRILLS, MINERAL PROSPECTING
Keystone Churn Drill Co., Beaver Falls, Pa.
Mott Core Drilling Co., Huntington, W. Va.

DRILLS, PNEUMATIC
Howells Mining Drill Co., Plymouth, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLS, PROSPECTING
H. R. Ameling Prospecting Co., Rolla, Mo.
Hoffman Bros., Punxsutawney, Pa.
Howells Mining Drill Co., Plymouth, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.
Keystone Churn Drill Co., Beaver Falls, Pa.
Mott Core Drilling Co., Huntington, W. Va.

DRILLS, ROCK
Diamond Machine Co., Monongahela, Pa.
General Electric Co., Schenectady, N. Y.
Howells Mining Drill Co., Plymouth, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

DRILL STEEL SHARPENERS
Ingersoll-Rand Co., 11 Broadway, New York City.
Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

DRIVES, SILENT CHAIN
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

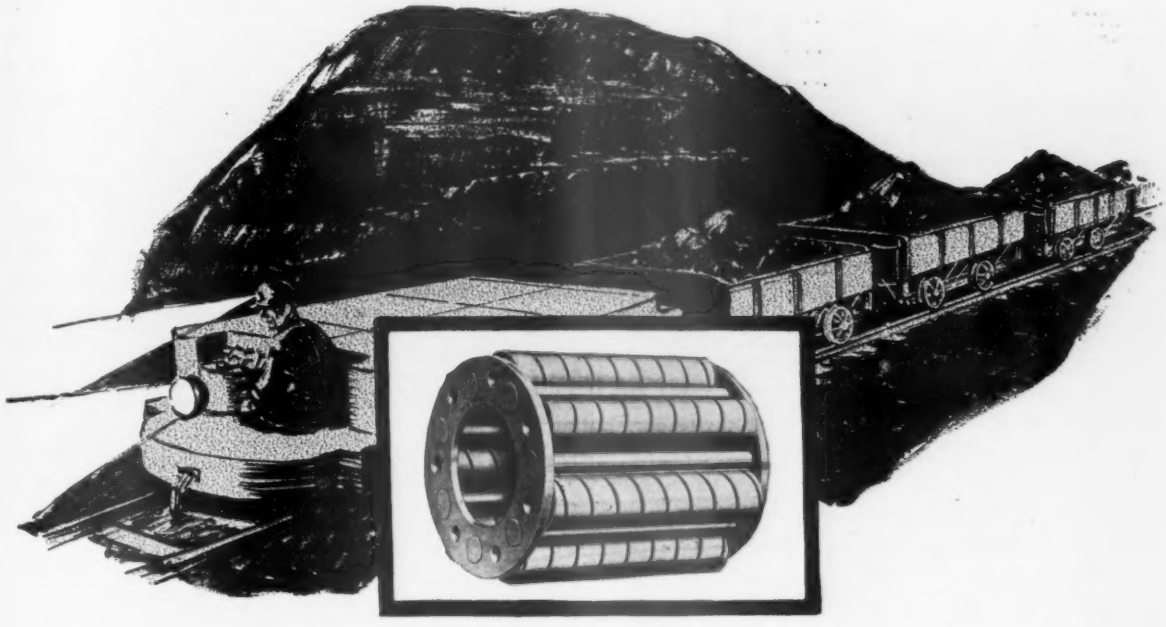
DRUMS (Hoisting, Haulage)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

DRYERS, ROTARY
Vulcan Iron Works, Wilkes-Barre, Pa.

DUMP CARS
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

DUMPS, ROTARY
Roberts & Schaefer Co., Chicago, Ill.

DYNAMITE
Atlas Powder Co., Wilmington, Del.
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Hercules Powder Co., 934 King St., Wilmington, Del.



Hyatts cost less than breakdowns

Operators everywhere are specifying Hyatt Roller Bearings for their mine cars to guard against bearing breakdowns, lubrication expense and time losses.

The cost of delays, due to ordinary bearings, is high. The cost of Hyatts, and permanent freedom from bearing difficulties, is negligible by comparison. One breakdown will more than pay for an entire Hyatt installation—and many years of flawless service.

Hyatt bearings are true anti-friction bearings. They stand the abuse of heavy loads and repeated shocks. They need no repairs or replacements. The only attention they require is three or four lubrications a year.

To be sure of steady, consistent production—to meet the urgent pressure of emergencies—demand Hyatt bearings in all your mine cars. Most builders furnish Hyatt equipment upon specification.

HYATT ROLLER BEARING COMPANY

Newark Huntington Pittsburgh Chicago Philadelphia
Detroit Oakland Worcester Cleveland Charlotte

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

DYNAMOS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Goodman Mfg. Co., Forty-eighth Place and Halsted St., Chicago, Ill.

ELECTRICAL APPARATUS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.

ELECTRICAL CABLES & WIRES
American Steel & Wire Co., Chicago, Ill., and New York.

ELECTRIC DRILLS
Howells Mining Drill Co., Plymouth, Pa.

ELECTRIC HOISTING MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

ELECTRIC LOCOMOTIVES
General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Forty-eighth Place and Halsted St., Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Ohio Brass Co., Mansfield, Ohio.

ELECTRIC LOCOMOTIVE CABLES
John A. Roebling's Sons Co., Trenton, New Jersey.

ELECTRIC MINE SUPPLIES
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

ELECTRIC WIRES AND CABLES
American Steel & Wire Co., Chicago and New York.

ELECTRICAL SUPPLIES
General Electric Co., Schenectady, N. Y.

ELECTRICAL WIRES & CABLES
John A. Roebling's Sons Co., Trenton, New Jersey.

ELECTRODES, WELDING
John A. Roebling's Sons Co., Trenton, New Jersey.

ELEVATORS
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

ELEVATORS, BUCKET
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

ELEVATOR CABLES & ROPES
John A. Roebling's Sons Co., Trenton, New Jersey.

ELEVATOR MACHINERY
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

ENGINES, GAS AND GASOLINE
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.

ENGINES (Hoisting and Hauling)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

ENGINES, OIL
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.

ENGINES, Rope Haulage
S. Flory Mfg. Co., Bangor, Pa.

ENGINES, STEAM
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.

ENGINES, Winding
S. Flory Mfg. Co., Bangor, Pa.

ENGINEERS
H. R. Ameling Prospecting Co., Rolla, Mo.

EXCAVATORS
Keystone Churn Drill Co., Beaver Falls, Pa.

EXPLOSIVES
Atlas Powder Co., Wilmington, Del.
du Pont Powder Co., The E. I., Wilmington, Del.
Hercules Powder Co., 934 King St., Wilmington, Del.

FAN DRIVES
Fawcus Machine Co., Pittsburgh, Pa.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

FANS, Man Cooling
Robinson Ventilating Co., Zelienople, Pa.

FANS, Turbine
Robinson Ventilating Co., Zelienople, Pa.

FANS, VENTILATING
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Robinson Ventilating Co., Zelienople, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

FEEDERS (Crossover, Kickback, Rotary and Dump)
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Mining Safety Device Co., Bowerston, Ohio.
Roberts & Schaefer Co., Chicago, Ill.

FEEDERS (Hand Operated)
Mining Safety Device Co., Bowerston, Ohio.
Roberts & Schaefer Co., Chicago, Ill.

FEEDERS, ORE
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

FEEDERS (Semi-automatic)
Mining Safety Device Co., Bowerston, Ohio.

FENCE POSTS
Sweet's Steel Co., Williamsport, Pa.

FIRE AND WEATHERPROOF WIRE
John A. Roebling's Sons Co., Trenton, New Jersey.

FLOORING, STEEL
Hendrick Mfg. Co., Carbondale, Pa.

FLOTATION MACHINES
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

FLOTATION OILS
Hercules Powder Co., 934 King St., Wilmington, Del.

FLOW METERS
General Electric Co., Schenectady, N. Y.

FLUX, WELDING
Oxweld Acetylene Co., 30 E. 42nd St., New York City.

FORGINGS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

FROGS
Sweet's Steel Co., Williamsport, Pa.

FROGS AND SWITCHES
Amer. Mine Door Co., Canton, Ohio.
Central Frog & Switch Co., Cincinnati, Ohio.
West Virginia Rail Co., Huntington, W. Va.

FURNACES, Oil (for drill steel)
Ingersoll-Rand Co., New York City.

FURNACES, ROASTING
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

GAS (Cutting, Welding)
Prest-O-Lite Co., Inc., 30 E. 42nd St., New York City.

GAS (Nitrogen, Oxygen)
Linde Air Products Co., 30 E. 42nd St., New York City.

GAUGES, WELDING
Oxweld Acetylene Co., 30 E. 42nd St. New York City.

GEARS
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

GEARS, BEVEL
Fawcus Machine Co., Pittsburgh, Pa.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

GEARS, HERRINGBONE
Fawcus Machine Co., Pittsburgh, Pa.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

GEARS, Machine Cut
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.

GEARS, Moulded Tooth
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.

GEARS, SILENT CHAIN
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

GEARS, SPUR
Fawcus Machine Co., Pittsburgh, Pa.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

GEARS, WORM
Fawcus Machine Co., Pittsburgh, Pa.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

GEARS, WORM WHEELS
Fawcus Machine Co., Pittsburgh, Pa.

GENERATORS AND GENERATING SETS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

GENERATORS, ACETYLENE
Oxweld Acetylene Co., 30 E. 42nd St., New York City.

GLOVES, ASBESTOS
Oxweld Acetylene Co., 30 E. 42nd St., New York City.

GOGGLES, WELDING
Oxweld Acetylene Co., 30 E. 42nd St., New York City.

GRATING, AREA, SIDEWALK
Hendrick Mfg. Co., Carbondale, Pa.

GREASE
Keystone Lubricating Co., Philadelphia, Pa.

GRINDERS, Portable Pneumatic
Ingersoll-Rand Co., New York City.

GUY ROPES, GALVANIZED
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey.

HAMMERS, Calking, Chipping & Riveting
Ingersoll-Rand Co., New York City.

HANGERS (Insulated Trolley)
Ohio Brass Co., Mansfield, Ohio.

HAULAGE ROPE
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey.

HEADLIGHTS, ARC AND INCANDESCENT
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Ohio Brass Co., Mansfield, Ohio.

HEATER CORD
John A. Roebling's Sons Co., Trenton, New Jersey.

HERRINGBONE GEAR DRIVES
Fawcus Machine Co., Pittsburgh, Pa.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

HOIST DRIVES
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

HOISTING ROPES
American Steel & Wire Co., Chicago, Ill., and New York.
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
A. Leschen & Sons Rope Co., St. Louis, Mo.
John A. Roebling's Sons Co., Trenton, New Jersey.

HOISTS
American Steel & Wire Co., Chicago and New York.
Ingersoll-Rand Co., 11 Broadway, New York City.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

HOISTS, AIR
Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

HOISTS, ELECTRIC
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Diamond Machine Co., Monongahela, Pa.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.

HOISTS, PORTABLE
Ingersoll-Rand Co., 11 Broadway, New York City.
Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

HOISTS, Derrick
S. Flory Mfg. Co., Bangor, Pa.

HOISTS, GASOLINE
S. Flory Mfg. Co., Bangor, Pa.

HOISTS, Room
S. Flory Mfg. Co., Bangor, Pa.

HOISTS, Room and Gathering
S. Flory Mfg. Co., Bangor, Pa.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

HOISTS, Scraper-Loader
Ingersoll-Rand Co., New York City.

HOISTS, Shaft, Electric
S. Flory Mfg. Co., Bangor, Pa.

HOISTS, Shaft, Steam
S. Flory Mfg. Co., Bangor, Pa.

HOISTS, Shaker Chute
S. Flory Mfg. Co., Bangor, Pa.

HOISTS, Slope, Electric
S. Flory Mfg. Co., Bangor, Pa.

HOISTS, Slope, Steam
S. Flory Mfg. Co., Bangor, Pa.

HOISTS, STEAM
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.
Vulcan Iron Works, Wilkes-Barre, Pa.

HOLDERS-ON RIVETING
Ingersoll-Rand Co., New York City.

HOOKS
John A. Roebling's Sons Co., Trenton, New Jersey.

HOSE, AIR AND STEAM
Ingersoll-Rand Co., 11 Broadway, New York City.

HOSE CLAMPS
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

HOSE COUPLINGS
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

HOSE CONNECTIONS, SPECIAL
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

HOSE MENDERS
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

HOSE NIPPLES
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

HOSE, WELDING
Oxweld Acetylene Co., 30 E. 42nd St., New York City.

HYDRATORS, LIME
Vulcan Iron Works, Wilkes-Barre, Pa.

INCINERATORS
Vulcan Iron Works, Wilkes-Barre, Pa.

INSULATORS, FEEDER WIRE
Ohio Brass Co., Mansfield, Ohio.

INSULATORS, SECTION
Amer. Mine Door Co., Canton, Ohio.
Ohio Brass Co., Mansfield, Ohio.

INSULATORS (Porcelain)
Ohio Brass Co., Mansfield, Ohio.

INSULATORS (Third Rail)
Ohio Brass Co., Mansfield, Ohio.

INSULATORS (Trolley)
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

INSULATED WIRE AND CABLE
American Steel & Wire Co., Chicago, Ill.
Roebling Sons, John A., Trenton, N. J.

KEYSTONE DRILLS
Keystone Churn Drill Co., Beaver Falls, Pa.

KEYSTONE EXCAVATORS
Keystone Churn Drill Co., Beaver Falls, Pa.

KILNS (Rotary)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Vulcan Iron Works, Wilkes-Barre, Pa.

KILNS, VERTICAL
Vulcan Iron Works, Wilkes-Barre, Pa.

LAMP CORD
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey.

LAMPS, ARC AND INCANDESCENT
General Electric Co., Schenectady, N. Y.

LEAD BURNING APPARATUS, Oxy-Acetylene, Oxy-City Gas
Oxweld Acetylene Co., 30 E. 42nd St., New York City.

LIGHT STEEL ANGLES
Sweet's Steel Co., Williamsport, Pa.

LIGHT STEEL RAILS (A. S. C. E. Sections)
Sweet's Steel Co., Williamsport, Pa.

LOADERS (Mine Car)
Conveyor Sales Co., Inc., 299 Broadway, New York City.
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

LOADERS, PORTABLE
Conveyor Sales Co., Inc., 299 Broadway, New York City.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

LOADING BOOMS
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

LOADING MACHINES
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Conveyor Sales Co., Inc., 299 Broadway, New York City.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

LOCOMOTIVES, ELECTRIC
General Electric Co., Schenectady, N. Y.
Goodman Mfg. Co., Halsted St. and 49th Pl., Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

LOCOMOTIVES, GASOLINE
Vulcan Iron Works, Wilkes-Barre, Pa.

LOCOMOTIVES, RACK RAIL
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

LOCOMOTIVES, STEAM
Vulcan Iron Works, Wilkes-Barre, Pa.

LOCOMOTIVES, STORAGE BATTERY
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

LOCOMOTIVE SWITCHING & WRECKING ROPES

LOCOMOTIVES (Third Rail)
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
John A. Roebling's Sons Co., Trenton, New Jersey.

LOCOMOTIVES, TROLLEY
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.

LONGWALL MACHINES
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

LUBRICANTS
Keystone Lubricating Co., Philadelphia, Pa.

LUBRICATORS
Keystone Lubricating Co., Philadelphia, Pa.

MACHINERY, TRANSMISSION (Power)
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

MANIFOLDS, OXYGEN
Oxweld Acetylene Co., 30 E. 42nd St., New York City.

MAST ARM ROPE, Galvanized
John A. Roebling's Sons Co., Trenton, New Jersey

MENDERS, HOSE
Knox Mfg. Co., Philadelphia, Pa.

MILLS, ROD & BALL
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

MILLS, STAMP
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

MINE CAR LUBRICATING
Keystone Lubricating Co., Philadelphia, Pa.

MINE-CARS
Enterprise Wheel & Car Corporation, Huntington, W. Va.

MINE DOORS, AUTOMATIC
American Mine Door Co., Canton, Ohio.

MINE LOCOMOTIVE CABLE
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey

MINE SIGNALS
American Mine Door Co., Canton, Ohio.

MINING & METALLURGICAL MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

MINING EQUIPMENT
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
Howells Mining Drill Co., Plymouth, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

MINING MACHINE CABLE
John A. Roebling's Sons Co., Trenton, New Jersey.

MINING MACHINES
Goodman Mfg. Co., Forty-eighth Place and Halsted St., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

MINING MACHINES (Electric)
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
Howells Mining Drill Co., Plymouth, Pa.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

MINING MACHINES (Government Approved)
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

MINING MACHINERY
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.
Howells Mining Drill Co., Plymouth, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

MINING SPECIALTIES
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

MOTORS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.

MOUNTED BOTTOM CUTTERS
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

MOVING PICTURE CORD
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey.

NIPPLES, HOSE
Knox Mfg. Co., Philadelphia, Pa.

NITROGEN GAS
Linde Air Products, 30 East 42nd St., New York City.

NOZZLES, MALLEABLE IRON
Knox Mfg. Co., Philadelphia, Pa.

OILERS, ROCK DRILL
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

OIL RIGS, PORTABLE
Keystone Churn Drill Co., Beaver Falls, Pa.

ORE, BUYERS AND SELLERS OF
Irvington Smelting & Refining Works, Irvington, N. J.
Phelps-Dodge Corporation, New York City.

ORE, CARNOTITE & VANADIUM
O. Barlow Willmarth, Georgetown, Colo.

OVERCUTTING MACH'S.
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

OXYGEN GAS
Linde Air Products, 30 East 42nd St., New York City.

OXY-ACETYLENE APPARATUS and SUPPLIES
Oxweld Acetylene Co., 30 E. 42nd St., New York City.

PATENT ATTORNEY
John Boyle, Jr., Ouray Bldg., Washington, D. C.

PAVING BREAKERS
Ingersoll-Rand Co., New York City.

PERFORATED METAL
Hendrick Mfg. Co., Carbondale, Pa.

PERMISSIBLES, Explosives
Atlas Powder Co., Wilmington, Del.
du Pont Powder Co., The E. I., Wilmington, Del.
Hercules Powder Co., Wilmington, Del.

PICKING TABLES
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

PIPE (Wood)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

PNEUMATIC HOSE COUPLINGS
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

PNEUMATIC TOOL
Ingersoll-Rand Co., 11 Broadway, New York City.

POWDER, BLASTING
Atlas Powder Co., Wilmington, Del.
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Hercules Powder Co., 934 King St., Wilmington, Del.

POWER CABLES
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey.

POWER SHOVELS
Keystone Churn Drill Co., Beaver Falls, Pa.

POWER TRANSMISSION MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

PREHEATING APPARATUS
Oxweld Acetylene Co., 30 E. 42nd St., New York City.

PROSPECTIVE DRILLS
H. R. Ameling Prospecting Co., Rolla, Mo.
Hoffman Bros., Punxsutawney, Pa.
Howells Mining Drill Co., Plymouth, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.
Mott Core Drilling Co., Huntington, W. Va.

PULLEYS
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

PULVERIZERS, COAL AND COKE
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.

PUMPS, Acid Resisting
Ingersoll-Rand Co., New York City.

PUMPS, AIR LIFT
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS, Boiler Feed
Ingersoll-Rand Co., New York City.

PUMPS, CENTRIFUGAL
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co. (A. S. Cameron Steam Pump Works), 11 Broadway, New York City.
Keystone Churn Drill Co., Beaver Falls, Pa.

PUMPS, DEEP WELL
Keystone Churn Drill Co., Beaver Falls, Pa.

PUMPS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Ingersoll-Rand Co. (A. S. Cameron Steam Pump Works), 11 Broadway, New York City.

PUMPS, Fire
Ingersoll-Rand Co., New York City.

PUMPS (Gathering or Dip)
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

PUMPS, Inclined Shaft
Ingersoll-Rand Co., New York City.

PUMPS, MINE
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Ingersoll-Rand Co. (A. S. Cameron Steam Pump Works), 11 Broadway, New York City.

PUMPS, Sinking
Ingersoll-Rand Co., New York City.

PUMPS, PNEUMATIC AIR LIFT
Ingersoll-Rand Co., 11 Broadway, New York City.

PUMPS, POWER
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Ingersoll-Rand Co. (A. S. Cameron Steam Pump Works), 11 Broadway, New York City.

PUMPS, SAND
Ingersoll-Rand Co. (A. S. Cameron Steam Pump Works), 11 Broadway, New York City.

PUMPS, STEAM
Ingersoll-Rand Co. (A. S. Cameron Steam Pump Works), 11 Broadway, New York City.

PUMPS, VACUUM
Ingersoll-Rand Co., 11 Broadway, New York City.

PUNCHES, Drill Steel
Ingersoll-Rand Co., New York City.

QUARRYING MACHINERY
Ingersoll-Rand Co., 11 Broadway, New York City.

QUARRYING SPECIALTIES
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

RADIO ACTIVE ORE
O. Barlow Willmarth, Georgetown, Colo.

RADIUM ORE
O. Barlow Willmarth, Georgetown, Colo.

RAIL BONDS
American Steel & Wire Co., Chicago and New York.
Ohio Brass Co., Mansfield, Ohio.

RAILWAY SUPPLIES
Ohio Brass Co., Mansfield, Ohio.

RAMMERS, Pneumatic
Ingersoll-Rand Co., New York City.

RECEIVERS, Air
Ingersoll-Rand Co., New York City.

REGULATORS, Welding, Compressed Gas
Oxweld Acetelyne Co., 30 E. 42nd St., New York City.

REHEATERS, Air
Ingersoll-Rand Co., New York City.

REINFORCING BARS
Sweet's Steel Co., Williamsport, Pa.
West Virginia Rail Co., Huntington, W. Va.

RIVER CROSSING SUSPENSION WIRE, Galvanized
John A. Roebling's Sons Co., Trenton, New Jersey.

RETARDERS
Mining Safety Device Co., Bowerston, Ohio.

ROCK-DISPOSAL EQUIPMENT
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

ROCK DRILL COUPLINGS
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

ROCK DRILL OILERS
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

ROCK DRILLS
Diamond Machine Co., Monongahela, Pa.
Howells Mining Drill Co., Plymouth, Pa.
Ingersoll-Rand Co., 11 Broadway, New York City.

ROCK DRILL THROTTLES
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

ROCK DUSTING MACHINES
Diamond Machine Co., Monongahela, Pa.

RODS, WELDING
Oxweld Acetelyne Co., 30 E. 42nd St., New York City.

ROLLER BEARINGS
Enterprise Wheel & Car Corporation, Huntington, W. Va.

ROLLS (Crushing)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

ROPE
American Steel & Wire Co., Chicago and New York.
Leschen & Sons Rope Co., A., St. Louis, Mo.

ROPE GREASE
Keystone Lubricating Co., Philadelphia, Pa.

ROPE, TRANSMISSION
American Steel & Wire Co., Chicago and New York.
Roebling Sons, John A., Trenton, N. J.

ROPE, WIRE
American Steel & Wire Co., Chicago and New York.
Leschen & Sons Rope Co., A., St. Louis, Mo.
Roebling Sons, John A., Trenton, N. J.

ROTARY DUMPS
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

ROTARY ROASTERS
Vulcan Iron Works, Wilkes-Barre, Pa.

RUNNING ROPE, Galvanized
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey.

SAFETY APPLIANCES, MINE
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.

SAND DRYERS
Roberts & Schaefer Co., Chicago, Ill.

SASH CORD
John A. Roebling's Sons Co., Trenton, New Jersey.

SCRAPER LOADERS
Goodman Mfg. Co., Halsted St., and 48th Place, Chicago, Ill.

SCREENS, HORIZONTAL
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

SCREENS, PERFORATED METAL
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

SCREENS, REVOLVING
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

SCREENS, SHAKER
Hendrick Mfg. Co., Carbondale, Pa.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

SCREENS AND PERFORATED SHEETING
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Hendrick Mfg. Co., Carbondale, Pa.

SCREENS & WASHERIES
American Rheolaveur Corporation, Wilkes-Barre, Pa.

SEIZING STRAND, GALVANIZED
John A. Roebling's Sons Co., Trenton, New Jersey.

SHARPENERS, DRILL
Ingersoll-Rand Co., 11 Broadway, New York City.
Sullivan Machinery Co., 122 S. Mich. Ave., Chicago, Ill.

SHEAVES
John A. Roebling's Sons Co., Trenton, New Jersey.

SHEAVE WHEELS
Vulcan Iron Works, Wilkes-Barre, Pa.

SHORT WALL ANCHORS
Amer. Mine Door Co., Canton, Ohio.

SHORTWALL MACHINES
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

SHOVEL — ELECTRO-HYDRAULIC
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

SIGNAL WIRES & CABLES
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey.

SIGNS (Mine)
Stonehouse Signs, Inc., 842 Larimer St., Denver, Colo.

SINKERS, ROCK DRILL
Ingersoll-Rand Co., 11 Broadway, New York City.

SKIPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.

SKIP LOADING EQUIPMENT
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

SLABBING MACHINES
Goodman Mfg. Co., Halsted St. and 48th Place, Chicago, Ill.

SMELTERS
Irvington Smelting & Refining Works, Irvington, N. J.

SOCKETS, Open and Closed
John A. Roebling's Sons Co., Trenton, New Jersey.

SPECIAL MACHINERY
Fawcus Machine Co., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

SPEED REDUCERS, DOUBLE
Fawcus Machine Co., Pittsburgh, Pa.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

SPEED REDUCERS, SINGLE
Fawcus Machine Co., Pittsburgh, Pa.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

SPIKES
Sweet's Steel Co., Williamsport, Pa.

SPLICE BARS (Plain and Angle)
Sweet's Steel Co., Williamsport, Pa.

SPLICE, CABLE
American Mine Door Co., Canton Ohio.
Ohio Brass Co., Mansfield, Ohio.

SPLICE, INSULATOR
American Mine Door Co., Canton, Ohio.

SPLICE, TROLLEY WIRE
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

SPLICERS, TROLLEY
Amer. Mine Door Co., Canton, Ohio.

SPROCKETS, COMPENSATING
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

SPROCKETS, SILENT CHAIN
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

SPROCKETS, SPRING
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

SPUR GEAR DRIVES
Fawcus Machine Co., Pittsburgh, Pa.
Link-Belt Co., 300 W. Pershing Road, Chicago, Ill.

STACKS, SMOKE
Hendrick Mfg. Co., Carbondale, Pa.

STARTER CABLES
John A. Roebling's Sons Co., Trenton, New Jersey.

STEAM HOSE COUPLINGS
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

STEEL CROSS TIES
Sweet's Steel Co., Williamsport, Pa.

STEEL, HOLLOW & SOLID DRILL
Ingersoll-Rand Co., 11 Broadway, New York City.

STEEL PLATE CONSTRUCTION
Hendrick Mfg. Co., Carbondale, Pa.

STEEL, REINFORCING
American Mine Door Co., Canton, Ohio.

STEEL TIES AND REINFORCEMENTS
West Virginia Rail Co Huntington, W. Va.

STEPS, SAFETY
Hendrick Mfg. Co., Carbondale, Pa.

STOPERS, ROCK DRILL
Ingersoll-Rand Co., 11 Broadway, New York City.

STORAGE BATTERY LOCOMOTIVES
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Vulcan Iron Works, Wilkes-Barre, Pa.

STRAND
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey.

SUCTION HOSE COUPLINGS
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

SURVEYOR'S SPADS
Howells Mining Drill Co., Plymouth, Pa.

SWITCHBOARD WIRE AND CABLES
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey.

SWITCHBOARDS, POWER
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

SWITCHES
Sweet's Steel Co., Williamsport, Pa.

SWITCHES (Disconnecting and Electric)
General Electric Co., Schenectady, N. Y.

SWITCHES AND FROGS, TROLLEY
American Mine Door Co., Canton, Ohio.
Central Frog & Switch Co., Cincinnati, Ohio.
Ohio Brass Co., Mansfield, Ohio.

TACKLE BLOCKS
John A. Roebling's Sons Co., Trenton, New Jersey.

TELEGRAPH AND TELEPHONE WIRES AND CABLES
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey.

TELEPHONE CORDS
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey.

THIMBLES
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey.

THROTTLES, Rock Drill
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

TIES (Steel, Mine)
Central Frog & Switch Co., Cincinnati, Ohio.

TILLER ROPE
John A. Roebling's Sons Co., Trenton, New Jersey.

TIMBER PRESERVING EQUIPMENT
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

TIPPLES
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

TIPPLE EQUIPMENT
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.

TIRE WIRES
John A. Roebling's Sons Co., Trenton, New Jersey.

TOOLS, Blacksmiths (for drill steel)
Ingersoll-Rand Co., New York City.

TOOLS & SUPPLIES
Keystone Churn Drill Co., Beaver Falls, Pa.

TORCHES, Brazing, Carbon Burning, Cutting, Lead Burning, Welding, Welding and Cutting
Oxweld Acetylene Co., 30 E. 42nd St., New York City.

TRACK BOLTS
Sweet's Steel Co., Williamsport, Pa.

TRACK EQUIPMENT
Sweet's Steel Co., Williamsport, Pa.

TRACK LAYOUTS (Industrial)
Sweet's Steel Co., Williamsport, Pa.

TRACKS, PORTABLE, RAIL, Etc.
Central Frog & Switch Co., Cincinnati, Ohio.
West Virginia Rail Co., Huntington, W. Va.

TRACK (Portable)
Sweet's Steel Co., Williamsport, Pa.

TRACK (Portable, Assembled and Unassembled, Riveted or Bolted)
Central Frog & Switch Co., Cincinnati, Ohio.
West Virginia Rail Co., Huntington, W. Va.

TRACK SUPPLIES
Central Frog & Switch Co., Cincinnati, Ohio.
West Virginia Rail Co., Huntington, W. Va.

TRAMWAYS, AERIAL
American Steel & Wire Co., Chicago, Ill.
Leschen & Sons Rope Co., A., St. Louis, Mo.

TRANSFORMERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

TRANSMISSION, SILENT CHAIN
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.

TREADS, SAFETY STAIR
Hendrick Mfg. Co., Carbondale, Pa.

TROLLEY FROGS
Ohio Brass Co., Mansfield, Ohio.

TROLLEY (Hangers and Clamps)
General Electric Co., Schenectady, N. Y.
Ohio Brass Co., Mansfield, Ohio.

TROLLEY MATERIAL, OVERHEAD
Ohio Brass Co., Mansfield, Ohio.

TROLLEY WHEELS AND HARPS
Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
Ohio Brass Co., Mansfield, Ohio.

TROLLEY WIRE
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey.

TRUCKS, WELDER'S
Oxweld Acetylene Co., 30 E. 42nd St., New York City.

TURBINE BLOWERS
Robinson Ventilating Co., Zelienople, Pa.

TURBINES, HYDRAULIC
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

TURBINES, STEAM
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

TURNBUCKLES
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey.

TURNOUTS
Sweet's Steel Co., Williamsport, Pa.

VALVES
Ohio Brass Co., Mansfield, Ohio.

VALVES, Back Pressure, Pressure Reducing
Oxweld Acetylene Co., 30 E. 42nd St., New York City.

VALVES, Plug
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

VALVES, Quarter Turn
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

VALVES, Quick Opening
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

VALVES, ROCK DRILL OILER
Knox Mfg. Co., Philadelphia, Pa.

VALVES, ROCK DRILL THROTTLE
Knox Mfg. Co., Philadelphia, Pa.

VALVES, Steam Throttle
Knox Mfg. Co., 811-821 Cherry St., Philadelphia, Pa.

VENTILATING EQUIPMENT
Robinson Ventilating Co., Zelienople, Pa.

VISES, Riggers
John A. Roebling's Sons Co., Trenton, New Jersey.

WAGON LOADERS
Conveyor Sales Co., Inc., 299 Broadway, New York City.
The Jeffrey Mfg. Company, 958-99 North 4th St., Columbus, Ohio.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

WASHERIES
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Roberts & Schaefer Co., Chicago, Ill.

WEIGH BASKETS
Roberts & Schaefer Co., Chicago, Ill.

WELDING and CUTTING APPARATUS, Etc. (Oxy-Acetylene)
Oxweld Acetylene Co., 30 E. 42nd St., New York City.

WELDING APPARATUS, ELECTRIC ARC
Ohio Brass Co., Mansfield, Ohio.

WELDING GAS
Prest-O-Lite Co., Inc., 30 E. 42nd St., New York City.

WELDING SUPPLIES
Oxweld Acetylene Co., 30 E. 42nd St., New York City.

WELDING WIRE, Electric
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey.

WELDING WIRE, Gas
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey.

WELL DRILLING MACHINERY
Keystone Churn Drill Co., Beaver Falls, Pa.

WELL DRILLING MACHINERY
Mott Core Drilling Co., Huntington, W. Va.

WELL DRILLS, for Water, Well and Gas
Keystone Churn Drill Co., Beaver Falls, Pa.

WIRE AND CABLE
American Steel & Wire Co., Chicago and New York.
Roebling Sons, The John A., Trenton, N. J.

WIRE ROPE
American Steel & Wire Co., Chicago, Ill.
Leschen & Sons Rope Co., A., St. St. Louis, Mo.

WIRE ROPE, in Special and Standard Constructions for all purposes
John A. Roebling's Sons Co., Trenton, New Jersey.

WIRE ROPE FITTINGS
American Steel & Wire Co., Chicago and New York.
Leschen & Sons Rope Co., A., St. St. Louis, Mo.

WIRE ROPE SLINGS
American Steel & Wire Co., Chicago, Ill., and New York.
John A. Roebling's Sons Co., Trenton, New Jersey.

WIRE ROPE TRAMWAYS
American Steel & Wire Co., Chicago, Ill.
Leschen & Sons Rope Co., A., St. Louis, Mo.

WIRE, WELDING
American Steel & Wire Co., Chicago, Ill., and New York.
Oxweld Acetylene Co., 30 E. 42nd St., New York City.

WOOD BORING MACHINES, Pneumatic
Ingersoll-Rand Co., New York City.

WOOL GREASE
Keystone Lubricating Co., Philadelphia, Pa.

WORM GEAR DRIVES
Fawcus Machine Co., Pittsburgh, Pa.

WRENCHES, ALLIGATOR
John A. Roebling's Sons Co., Trenton, New Jersey.

American Mining Congress

OFFICERS AND COMMITTEES, 1927

OFFICERS

Hugh Shirkie, *President*
E. L. Doheny, *First Vice-President*
Wm. H. Lindsey, *Second Vice-President*
Robert E. Tally, *Third Vice-President*
J. F. Callbreath, *Secretary*

DIVISION STAFF

George H. Bailey, *Counsel*
M. W. Kriegh, *Tax Division*
Dr. Henry Mace Payne, *Consulting Engineer*
E. H. Pullman, *Publicity Department*
E. R. Coombes, *Asst. to Secretary*

DIRECTORS

Bulkeley Wells, San Francisco, Calif.
Sidney J. Jennings, New York, N. Y.
S. Pemberton Hutchinson, Philadelphia, Pa.
George B. Harrington, Chicago, Ill.
Wm. H. Lindsey, Nashville, Tenn.
J. G. Bradley, Dundon, W. Va.
W. J. Loring, Los Angeles, Calif.
H. W. Seaman, Chicago, Ill.
E. L. Doheny, New York, N. Y.
Hugh Shirkie, Terre Haute, Ind.
Stanly Easton, Kellogg, Idaho.
L. S. Cates, Salt Lake City, Utah.
Robert E. Tally, Clarkdale, Ariz.

EXECUTIVE COMMITTEE

H. W. Seaman — Hugh Shirkie
George B. Harrington

WESTERN DIVISION

BOARD OF GOVERNORS

Imer Pett, Salt Lake City, *Chairman of the Division.*
A. G. Mackenzie, Salt Lake City, *Secretary of the Division.*
Arizona—Robert E. Tally, United Verde Copper Co., Jerome, Ariz.; W. B. Gohring, 419 Heard Building, Phoenix, Ariz.
California—Robert I. Kerr, 519 California St., San Francisco, Calif.; P. C. Knapp, Natomas Co. of Calif., San Francisco.
Colorado—Jesse F. McDonald, Denver, Colo.; M. B. Tomblin, 437 State Office Building, Denver, Colo.
Idaho—A. P. Ramstedt, Wallace, Idaho; Ravenel Macbeth, Idaho Mining Association, Wallace, Idaho.
Montana—W. B. Daly, Anaconda Copper Mining Co., Butte, Mont.
Nevada—Henry M. Rives, Nevada Mine Operators' Assn., Reno, Nev.; C. B. Lakenan, Nevada Cons. Copper Mining Co., McGill, Nev.
New Mexico—John M. Sully, Chino Copper Co., Hurley, N. Mex.; Jos. Woodbury, New Mexico Chapter, The American Mining Congress, Silver City, N. Mex.
Oregon—Robert M. Betts, Cornucopia Mining Co., Cornucopia, Oreg.
South Dakota—B. C. Yates, Homestake Mining Co., Lead, S. Dak.
Utah—Imer Pett, Bingham Mines Co., Salt Lake City; A. G. Mackenzie, 212 Kearns Building, Salt Lake City, Utah.
Washington—Raymond Guyer, Symons Building, Spokane, Wash.

SOUTHERN DIVISION

BOARD OF GOVERNORS

C. J. Griffith, Arkansas Central Power Co., Little Rock, Ark., *Chairman of the Division.*
H. B. Flowers, New Orleans Public Service, Inc., New Orleans, La.
Howard I. Young, American Zinc Company of Tennessee, Mascot, Tenn.
I. N. Day, Dawson Springs, Ky.
W. H. Smith, Sec'y-Mgr., Chamber of Commerce, Laurel, Miss.
J. L. Davidson, Secy., Alabama Mining Institute, Birmingham, Ala.
C. G. Memminger (Florida) Pres., Coronet Phosphate Co., Asheville, N. C.
J. M. Mallory, Industrial Agent, Central of Georgia Rwy., Savannah, Ga.
E. L. Hertzog, Cherokee Mining Co., Spartanburg, S. C.
Dr. A. F. Greaves-Walker, Dean, School of Ceramics, Raleigh, N. C.
C. W. Johnston, Manager, The Virginia Smelting Co., West Norfolk, Va.
J. G. Bradley, Elk River Coal & Lumber Co., Dundon, W. Va.
S. J. Ballinger, San Antonio Public Service Co., San Antonio, Tex.
Prof. E. E. Tourtelotte, Pres., School of Mines, Wilburton, Okla.

MANUFACTURERS DIVISION

OFFICERS

Honorary Chairmen

N. S. Greensfelder, Hercules Powder Co., Wilmington, Del.
J. C. Wilson, Ohio Brass Co., Mansfield, Ohio.

Chairman

H. K. Porter, Hyatt Roller Bearing Co., Harrison, N. J.

Vice-Chairmen

H. A. Buzby, Keystone Lubricating Co., Philadelphia, Pa.
C. L. Herbster, Hockensmith Wheel & Mine Car Co., Penn, Pa.
F. J. Maple, John A. Roebling's Sons Co., Trenton, N. J.

Members

American Car & Foundry Co., 30 Church St., New York City. H. C. Wick.
Atlas Powder Co., Wilmington, Del. G. S. Scott.
Automatic Reclosing Circuit Breaker Co., Columbus, Ohio. C. M. Hickle.
Carnegie Steel Co., Pittsburgh, Pa. R. L. Twitchell.
Central Frog & Switch Co., Cincinnati, Ohio. E. R. Heitzmann.
Cutler-Hammer Mfg. Co., Milwaukee, Wis. G. S. Crane.
Dravo-Doyle Co., Dravo Bldg., Pittsburgh, Pa. E. F. Austin.
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. E. F. Carley.
Edison Storage Battery Co., Orange, N. J. G. E. Stringfellow.
Electric Railway Equipment Co., Cincinnati, Ohio. A. L. Johnston.
Enterprise Wheel & Car Corp., Bristol, Va.-Tenn., C. P. Daniel.
General Electric Co., Schenectady, N. Y. L. W. Shugg.
Hendrick Mfg. Co., Carbondale, Pa. H. S. Lee.
Hercules Powder Co., Wilmington, Del. N. S. Greensfelder.
Hockensmith Wheel & Mine Car Co., Penn, Pa. C. L. Herbster.
Robt. Holmes & Bros., Inc., Danville, Ill. Grant Holmes, Pres.
Hyatt Roller Bearing Co., Newark, N. J. H. K. Porter.
Keystone Consolidated Publishing Co. Ralph C. Becker, 10th Ave. at 36th St., New York City.
Keystone Lubricating Co., Philadelphia, Pa. H. A. Buzby.
Link-Belt Co., Chicago, Ill. Rex Martin.
Ludlow-Saylor Wire Co., St. Louis, Mo. Duncan Meier.
Mancha Storage Battery Locomotive Co., St. Louis, Mo. Chas. C. Mancha.
Mine Safety Appliances Co., Pittsburgh, Pa. J. T. Ryan.
Myers-Whaley Co., Knoxville, Tenn. Wm. A. Whaley.
Morse Chain Co., Ithaca, N. Y. C. L. Saunders.
National Carbon Co., Inc., P. O. Box 400, Cleveland, Ohio. E. A. Williford.
Ohio Brass Co., Mansfield, Ohio. J. C. Wilson.
Phillips Mine & Mill Supply Co., Pittsburgh, Pa. J. Milton Duff.
Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill. Col. W. R. Roberts, Pres.
John A. Roebling's Sons Co., Trenton, N. J. F. J. Maple.
Southern Wheel Co., St. Louis, Mo. F. C. Turner, Vice-Pres., 1308 Keystone Bldg., Pittsburgh, Pa.
Streeter-Amet Weighing & Recording Co., Chicago, Ill. H. F. Reck.
Timken Roller Bearing Co., Canton, Ohio. E. R. Phillips.
W. S. Tyler Co., Cleveland, Ohio. G. R. Delamater.
Watt Car & Wheel Co., Barnesville, Ohio. H. H. Watt.
Weir Kilby Corpn., Cincinnati, Ohio. J. K. Lansdowne.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. P. H. Grunnagle.

TAX DIVISION

GENERAL TAX COMMITTEE

Paul Armitage, *Chairman*
233 Broadway, New York, N. Y.
Geo. E. Holmes, *Vice-Chairman*
15 William St., New York, N. Y.

R. C. Allen, Hanna Building, Cleveland, Ohio.
A. Scott Thompson, Miami, Okla.
Wm. B. Gower, 20 Exchange Place, New York, N. Y.
R. V. Norris, 520 Second National Bank Bldg., Wilkes-Barre, Pa.
J. C. Dick, 511 Newhouse Bldg., Salt Lake City, Utah.
A. P. Ramstedt, Wallace, Idaho.
E. L. Doheny, 120 Broadway, New York City.
T. O. McGrath, Bisbee, Ariz.
Robt. N. Miller, Southern Bldg., Washington, D. C.
H. B. Fernald, 50 Broad St., New York City.
T. T. Brewster, Federal Res. Bank Bldg., St. Louis, Mo.
Wm. N. Davis, Bartlesville, Okla.

STANDARDIZATION DIVISION

Metal and Coal Mining Branches

COAL MINING BRANCH

General Committee

Colonel Warren R. Roberts (*Chairman*), Pres., Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.
A. B. Kiser, Supt. of Elec. Equipment, Pittsburgh Coal Co., Pittsburgh, Pa.
R. E. Krape, Gen. Mgr., Timber Dept., Rochester & Pittsburgh Coal & Iron Co., Indiana, Pa.
J. A. Malady, Master Mech. & Elec. Engr., Hillman Coal & Coke Co., 2307 First Natl. Bank Bldg., Pittsburgh, Pa.
James Needham, Genl. Supt. of Mines, St. Paul Coal Co., 1368 Fullerton Ave., Chicago, Ill.
Fred Norman, Chf. Engr., Allegheny River Mining Co., Kittanning, Pa.
F. L. Stone, Industrial Engr. Dept., General Electric Co., Schenectady, N. Y.
C. H. Trik, Sales and Mine Ventilation Engr., Jeffrey Mfg. Co., Columbus, Ohio.
L. E. Young, Vice President, Pittsburgh Coal Co., Pittsburgh, Pa.

Coal Mine Mechanization Investigation

G. B. Southward, Engr. in charge, 841 Munsey Bldg., Washington, D. C.

Underground Transportation

Fred Norman, *Chairman*

MAIN COMMITTEE

Fred Norman (*Chairman*), Chf. Engr., Allegheny Rivers Mining Co., Kittanning, Pa.
Frank S. Barks, Pres., Lincoln Steel and Forge Co., St. Louis, Mo.
Graham Bright, Cons. Engr., Howard N. Eavenson & Associates, 1302 Union Trust Bldg., Pittsburgh, Pa.
Jos. Bryan, Salesman, General Electric Co., 535 Smithfield St., Pittsburgh, Pa.
John T. Cherry, Genl. Supt., B. F. Berry Coal Co., Standard, Ill.
Frederick C. Coseo, Chf. Draftsman, Jeffrey Mfg. Co., Columbus, Ohio.
A. H. Ehle, Mgr., Domestic Sales, Baldwin Locomotive Works, 500 N. Broad St., Philadelphia, Pa.
W. J. Fene, Asst. Chf. Engr., Mine Safety Service, U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh, Pa.
Robert J. Forester, Supt., Paradise Coal Co., Du Quoin, Ill.
J. B. Forrester, Chf. Engr., United States Fuel Co., Hiawatha, Utah.
J. D. Martin, Genl. Supt. of Coal Mines, Virginia Iron, Coal & Coke Co., Payne Bldg., Roanoke, Va.
Charles M. Means, Cons. Engr., Charles M. Means Co., 447 Oliver Bldg., Pittsburgh, Pa.
Arthur Neale, Ass't Gen'l Mgr. of Mines, Pittsburgh Coal Co., 1018 Oliver Bldg., Pittsburgh, Pa.
T. A. Parker, 407 Olive St., St. Louis, Mo.
Chas. H. Partington, Chief Engr., Cincinnati Frog & Switch Co., Cincinnati, Ohio.
H. K. Porter, Car & Truck Dept., Hyatt Roller Bearing Co., Newark, N. J.
G. H. Shapter, Commercial Engr., Industrial Dept., General Electric Co., Erie, Pa.
E. A. Watters, Genl. Supt., Hick Coal Companies, Box 405, Leechburg, Pa.
C. E. Watts, Mech. Engr., Berwind White Coal Mining Co., Windber, Pa.

SUB-COMMITTEE NO. 1—COAL MINE CAR DESIGN AND CONSTRUCTION

Arthur Neale (*Chairman*), Ass't. Genl. Mgr. of Mines, Pittsburgh Coal Co., 1018 Oliver Bldg., Pittsburgh, Pa.
H. M. Estabrook, Standard Steel Car Co., Frick Bldg., Pittsburgh, Pa.
C. L. Herbster, Vice-Pres., Hockensmith Wheel & Mine Car Co., Penn, Pa.
R. L. Kingsland, Genl. Supt., Power & Mechanical Dept., Consolidation Coal Co., Fairmont, W. Va.
James Milliken, Pres., Pittsburgh Testing Laboratory, P. O. Box 1115, Pittsburgh, Pa.
W. C. Sanders, Rwy. Equipment Engr., Timken Roller Bearing Co., Canton, Ohio.
C. E. Watts, Mech. Engr., Berwind White Coal Mining Co., Windber, Pa.
Victor Willoughby, Gen. Mech. Engr., Amer. Car & Foundry Co., 165 Broadway, New York City.
C. K. Witmer, Master Mechanic, Westmoreland Coal Co., Irwin, Pa.

SECTIONAL COMMITTEE ON TYPES OF HAND BRAKES

R. H. Kudlich (*Chairman*), U. S. Bureau of Mines, Washington, D. C.
Thos. G. Fear, Engr. of Transportation, Consolidation Coal Co., Fairmont, W. Va.
Wm. J. Hill, Senior Mine Inspector, Travelers Insurance Co., 1103 Commonwealth Bldg., Pittsburgh, Pa.
W. H. Robinson, Chf. Inspector, The Associated Companies, 207 Fulton Bldg., Pittsburgh, Pa.

SECTIONAL COMMITTEE ON MINE CAR WHEELS

C. K. Witmer (*Chairman*), Master Mechanic, Westmoreland Coal Co., Irwin, Pa.
W. E. Farrell, Pres., Easton Car and Construction Co., Easton, Pa.
John M. Lewis, Chf. Engr., Houston Coal and Coke Co., 1532 Union Trust Bldg., Cincinnati, O
Arthur Neale, Asst. Genl. Mgr. of Mines, Pittsburgh Coal Co., 1018 Oliver Bldg., Pittsburgh, Pa.
Cecil W. Smith, Chf. Engr., Illinois Coal Corpn., 1380 Old Colony Bldg., Chicago, Ill.
W. G. Srodes, Supt., Coal and Coke Dept., Shenango Furnace Co., Ligonier, Pa.

OFFICERS AND COMMITTEES, 1927 (Continued)

SUB-COMMITTEE NO. 2—MINE TRACKS AND SIGNALS

Chas. H. Partington (*Chairman*), Chief Engineer, The Cincinnati Frog & Switch Co., Cincinnati, Ohio.
C. A. Alden, Chief Engineer, Frog & Switch Dept., Bethlehem Steel Co., Steelton, Pa.
Geo. Ashton, Pres., The Central Frog & Switch Co., Cincinnati, Ohio.
Geo. M. Crawford, Crawford Machinery Co., Bessemer Bldg., Pittsburgh, Pa.
A. A. Culp, Consulting Engineer, Brown-Marx Bldg., Birmingham, Ala.
T. H. Edelblute, Representative of the Cincinnati Frog & Switch Co., Wabash Bldg., Pittsburgh, Pa.
Wm. F. Henke, Asst. Engr., the Cincinnati Frog & Switch Co., Cincinnati, Ohio.
F. C. Hohn, Consulting Engineer, Pennsylvania Appraisement Co., Scranton, Pa.
Wm. G. Hulbert, Genl. Supt., Wm. Wharton, Jr., Company, Easton, Pa.
R. L. Ireland, Jr., M. A. Hanna Co., Cleveland, Ohio.
H. L. Koch, Mgr., Industrial Dept., Sweet's Steel Co., 2 Rector St., New York City.
Fred Norman, Chief Engineer, Allegheny River Mining Co., Kittanning, Pa.
W. Perdue, Chief Engineer, Western Plants, Ramapo-Ajax Corporation, Chicago, Ill.
S. F. Perry, Representative of the Cincinnati Frog & Switch Co., Pittsburgh, Pa.
J. B. Strong, President, Ramapo-Ajax Corporation, 30 Church St., New York City.
J. R. Ulrich, Bethlehem Steel Co., Bethlehem, Pa.
H. N. West, Chief Engineer, Weir-Kilby Corporation, Norwood, Ohio.

SUB-COMMITTEE NO. 3—MINE LOCOMOTIVES

Graham Bright (*Chairman*), Cons. Engr., Howard N. Eavenson & Associates, 1302 Union Trust Bldg., Pittsburgh, Pa.
Jos. Bryan, Salesman, General Electric Co., 535 Smithfield St., Pittsburgh, Pa.
Frederick C. Coseo, Chf. Draftsman, Jeffrey Mfg. Co., Columbus, Ohio.
A. H. Ehle, Mgr., Domestic Sales, Baldwin Locomotive Works, 500 N. Broad St., Philadelphia, Pa.
S. W. Farnham, Mng. Engr., Goodman Mfg. Co., 4834 S. Halsted St., Chicago, Ill.
W. J. Fene, Asst. Chf. Engr., Mine Safety Service, U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh, Pa.
G. H. Shapter, Commercial Engr., Industrial Dept., General Electric Co., Erie, Pa.

Mining and Loading Equipment

L. E. Young, *Chairman*

SUB-COMMITTEE NO. 1—LOADERS

T. E. Jenkins (*Chairman*), Vice-Pres., West Kentucky Coal Co., Sturgis, Ky.
Newell G. Alford, Cons. Engr., Howard N. Eavenson & Associates, Union Trust Bldg., Pittsburgh, Pa.
Frank E. Cash, United States Bureau of Mines, 4800 Forbes St., Pittsburgh, Pa.
Walter M. Dake, Joy Machine Co., Franklin, Pa.
A. C. Green, Goodman Mfg. Co., Chicago, Ill.
G. W. Hay, Genl. Mgr., Consolidation Coal Co., Watson Bldg., Fairmont, W. Va.
F. V. Hicks, Union Pacific Coal Co., Rock Springs, Wyo.
N. D. Levin, Jeffrey Mfg. Co., Columbus, Ohio.
N. H. McClevey, Vice-Pres. & Genl. Mgr., Pike County Coal Corpn., Petersburg, Ind.
E. S. McKinlay, Pres., McKinlay Mng. & Loading Machine Co., Pt. Pleasant, W. Va.
Alex Palmros, Link-Belt Co., Philadelphia, Pa.
Norton A. Newdick, The Coloder Co., Columbus, Ohio.
W. D. Turnbull, Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Wm. Whaley, Genl. Mgr., Myers-Whaley Co., Knoxville, Tenn.

SUB-COMMITTEE NO. 2—CONVEYORS

A. P. Cameron (*Chairman*), Vice-Pres., Westmoreland Coal Co., Irwin, Pa.
C. H. Adamson, Stephens-Adamson Mfg. Co., Aurora, Ill.
W. L. Affelder, Asst. to Pres., Hillman Coal & Coke Co., First Natl. Bank Bldg., Pittsburgh, Pa.
J. A. Appleton, Ironton Engine Co., Ironton, Ohio.
John S. Beltz, Mining Engineering Dept., Jeffrey Mfg. Co., Columbus, Ohio.
Frank E. Cash, U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh, Pa.
T. W. Dawson, Chief Engr., H. C. Frick Coke Co., Scottdale, Pa.
Thos. G. Fear, Engr. of Transportation, Consolidation Coal Co., Fairmont, W. Va.
Chas. Gottschalk, Cons. Engr., Evansville, Ind.
Glen A. Knox, Supt., Gunn-Quealy Co., Gunn, Wyo.
E. F. Miller, Genl. Supt., Bertha-Consumers Co., Rachel, W. Va.
Edw. B. Raiguel, Cons. Engr., First Natl. Bank Bldg., Huntington, W. Va.
D. A. Stout, Chief Engineer of Mines, Fuel Dept., Colorado Fuel & Iron Co., Pueblo, Colo.
W. D. Turnbull, Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
J. D. Zook, Vice-Pres., Illinois Coal Corpn., Chicago, Ill.

SUB-COMMITTEE NO. 3—METHODS OF MINING WITH MECHANICAL LOADING

G. B. Southward (*Chairman*), Coal Service Corporation, Elkins, W. Va.
A. R. Anderson, Jeffrey Mfg. Co., Columbus, Ohio.
D. J. Carroll, Cons. Engr., 626 Railway Exchange Bldg., Chicago, Ill.
Frank E. Cash, U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh, Pa.
Clarence R. Claghorn, Cons. Mng. Engr., 715 Continental Bldg., Baltimore, Md.
E. H. Coxe, Cons. Engr., Uniontown, Pa.
S. W. Farnham, Goodman Mfg. Co., Chicago, Ill.
E. H. Johnson, The Coloder Co., Columbus, Ohio.
R. G. Lawry, Contracting Engr., Roberts & Schaefer Co., Chicago, Ill.
Rex Martin, Link-Belt Co., Chicago, Ill.
E. S. McKinlay, Pres., McKinlay Mining & Loading Machine Co., Pt. Pleasant, W. Va.
Cecil W. Smith, Chief Engr., Illinois Coal Corpn., Chicago, Ill.
Walter Stevens, Supt., Raleigh-Wyoming Coal Co., Glen Rogers, W. Va.
F. W. Whiteside, Chief Engineer, Victor-American Fuel Co., Denver, Colo.
F. G. Wilcox, Pres., West End Coal Co., Mears Bldg., Scranton, Pa.
R. Y. Williams, Chf. Engr., Weston Dodson & Co., Inc., Shenandoah, Pa.

SUB-COMMITTEE NO. 4—CUTTING MACHINES

Carl Scholz (*Chairman*), Raleigh-Wyoming Coal Co., Charleston, W. Va.
E. K. Bowers, Asst. Treas., Morgan-Gardner Elec. Co., Chicago, Ill.
Walter Calverley, Pres., W. R. Calverley, Inc., Clarion, Pa.
Frank E. Cash, U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh, Pa.
J. M. Clark, Vice-Pres., Clark & Krebs, Inc., Charleston, W. Va.
R. L. Cox, Jeffrey Mfg. Co., Charleston, W. Va.
Wm. E. Hamilton, Mgr., Hamilton Engineering Co., Columbus, Ohio.
A. W. Hesse, Chf. Mng. Engr., Buckeye Coal Co., Nemacolin, Pa.
E. S. McKinlay, Pres., McKinlay Mining & Loading Machine Co., Pt. Pleasant, W. Va.
M. C. Mitchell, Mgr., Sullivan Machinery Co., Rwy. Exchange Bldg., St. Louis, Mo.

Mine Drainage

J. A. Malady, *Chairman*

SUB-COMMITTEE NO. 1—PUMPS FOR DEVELOPMENT WORK

L. W. Householder (*Chairman*), Chf. Engr., Rochester & Pittsburgh Coal & Iron Co., Indiana, Pa.
E. F. Austin, Dravo-Doyle Co., Pittsburgh, Pa.
Herbert Axford, Sales Engr., Ingersoll-Rand Co., 610 Spruce St., Scranton, Pa.
J. H. Edwards, Associate Editor, Coal Age, 2962 Winters Rd., Huntington, W. Va.
F. J. Emeny, Vice Pres., The Deming Co., Salem, Ohio.
J. E. Holveck, Dist. Mgr., Aldrich Pump Co., 1209 Empire Bldg., Pittsburgh, Pa.
G. E. Huttle, Mech. Engr., H. C. Frick Coke Co., Scottdale, Pa.
Chas. H. Matthews, Genl. Engr. in Chg. Mining Section, Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
H. J. Nelms, Genl. Supt., New Field By-Products Coal Co., North Bessemer, Pa.
F. W. Smith, Hydroelectric Pump & Supply Co., Curry Bldg., Pittsburgh, Pa.

SUB-COMMITTEE NO. 2—PERMANENT PUMPING STATIONS

Parker Cott (*Chairman*), Salesman, Coal Mine Equipment Co., 2218 Farmers Bank Bldg., Pittsburgh, Pa.
Herbert Axford, Sales Engr., Ingersoll-Rand Co., 610 Spruce St., Scranton, Pa.
Henry E. Cole, Vice Pres., Harris Pump & Supply Co., 320 Second Ave., Pittsburgh, Pa.
J. P. Heidenreich, Asst. Genl. Mgr., Scranton Pump Co., Scranton, Pa.
W. L. Robison, Vice Pres., Youghiogheny & Ohio Coal Co., 1230 Hanna Bldg., Cleveland, Ohio.
R. F. Roth, Emmons Coal Mining Co., Altoona, Pa.
Cecil W. Smith, Chf. Engr., Illinois Coal Corpn., 1380 Old Colony Bldg., Chicago, Ill.
M. Spillman, Works Engr., Worthington Pump & Machinery Corpn., Harrison, N. J.
L. D. Tracy, Supt., U. S. Bureau of Mines, 312 Ceramics Bldg., Urbana, Ill.

SUB-COMMITTEE NO. 3—NATURAL DRAINAGE

John Brunschwyler (*Chairman*), Div. Supt., Boomer Coal & Coke Co., Boomer, W. Va.
M. C. Benedict, Cons. Engr., Brown Equipment Co., 940 Ash St., Johnstown, Pa.
Oscar Cartlidge, Cons. Engr., 1593 Lee St., Charleston, W. Va.
L. P. Crecelius, Engr., Cleveland & Western Coal Co., 1517 Union Trust Bldg., Cleveland, Ohio.
E. D. Knight, 2207 Washington St., Charleston, W. Va
R. Y. Wert, Supt., Durham Coal & Iron Co., Soddy, Tenn.

SUB-COMMITTEE NO. 4—UNWATERING ABANDONED WORKINGS

Prof. John W. Hallock (*Chairman*), Head of Department of Industrial Engineering, University of Pittsburgh, Pittsburgh, Pa.
G. E. Huttle, Mech. Engr., H. C. Frick Coke Co., Scottdale, Pa.
J. A. Malady, Master Mech. & Elec. Engr., Hillman Coal & Coke Co., Pittsburgh, Pa.
O. M. Pruitt, Pres., Indiana Air Pump Co., Indiana Pythian Bldg., Indianapolis, Ind.
Chas. A. Straw, Cons. Mech. Engr., Hudson Coal Co., 434 Wyoming Ave., Scranton, Pa.
G. V. Woody, Mgr., Allis-Chalmers Mfg. Co., Wilkes-Barre, Pa.

SUB-COMMITTEE NO. 5—MINE WATER AND ITS ACTION UPON MINE DRAINAGE EQUIPMENT

M. L. Bettcher, Production Engr., The Duriron Co., Inc., Dayton, Ohio.
J. R. Campbell, Hudson Coal Co., Scranton, Pa.
Geo. Watkin Evans, Cons. Coal Mng. Engr., L. C. Smith Bldg., Seattle, Wash.
Carl J. Fletcher, Vice Pres., Knox Coal Mng. Co., Merchants Bank Bldg., Indianapolis, Ind.
C. L. Harrod, Elec. Engr., Indiana Coal Oprs. Power Assn., 1509 Merchants Bank Bldg., Indianapolis, Ind.
Martin J. Lide, Cons. Engr., Woodward Bldg., Birmingham, Ala.
Frank G. Morris, Genl. Supt. of Mines, Republic Iron & Steel Co., Sayreton, Ala.
L. D. Rover, Power & Construction Dept., Ford Motor Co., Detroit, Mich.
W. H. Waddington, Sales Engr., Driver-Harris Co., Harrison, N. J.

Mine Ventilation

C. H. Trik, *Chairman*

SUB-COMMITTEE NO. 1—AIR SHAFTS AND AIR WAYS

J. C. Gaskill (*Chairman*), Asst. Cons. Engr., Consolidation Coal Co., Fairmont, W. Va.
C. H. Beidenmiller, Mgr., Glogora Coal Co., 705 First Natl. Bank Bldg., Huntington, W. Va.
J. H. Doughty, Mech. Engr., Lehigh & Wilkes-Barre Coal Co., 16 So. River St., Wilkes-Barre, Pa.
Robert Wallace, Supt., Pocahontas Fuel Co., Inc., Pocahontas, Va.
Jos. J. Walsh, Secretary of Mines, Pennsylvania Dept. of Mines, Harrisburg, Pa.

SUB-COMMITTEE NO. 2—MINE FAN INSTALLATION

G. E. Lyman (*Chairman*), Genl. Supt., Madison Coal Corpn., Glen Carbon, Ill.
H. G. Conrad, Genl. Mgr., American Coal Mining Co., Bicknell, Ind.
R. B. Fleming, Evansburg Coal Co., Colver, Pa.
E. B. Wagner, Lehigh Valley Coal Co., Wilkes-Barre, Pa.

SUB-COMMITTEE NO. 3—BOOSTER FANS

R. Dawson Hall (*Chairman*), Engineering Editor, Coal Age, 10th Ave. at 36th St., New York City.
Howard N. Eavenson, Pres., Howard N. Eavenson & Associates, 1302 Union Trust Bldg., Pittsburgh, Pa.
R. H. Moore, Genl. Mgr., C. A. Hughes & Co., Portage, Pa.
E. N. Zern, Editor, Mining Catalog, Keystone Cons. Publishing Co., 800 Penn Ave., Pittsburgh, Pa.

SUB-COMMITTEE NO. 4—MINE ATMOSPHERE

Thomas Chester (*Chairman*), Cons. Engr., 713 B. Copeland St., Pittsburgh, Pa.
Martin J. Lide, Cons. Engr., Woodward Bldg., Birmingham, Ala.
R. M. Perry, Genl. Supt., Moffat Coal Co., 504 Gas & Elec. Bldg., Denver, Colo.

Outside Coal Handling Equipment

James Needham, *Chairman*

Hubb Bell, Sales Chemist, C. P. Chemical & Drug Co., Inc., 114 Liberty St., New York City.
J. W. Bischoff, Vice Pres. & Genl. Mgr., West Virginia Coal & Coke Co., Elkins, W. Va.
W. G. Duncan, Jr., Supt., W. G. Duncan Coal Co., Greenville, Ky.
H. H. Elkins, Supt. of Mines, Valley Camp Coal Co., St. Clairsville, Ohio.
W. C. Henning, Secretary and Treasurer, A. Leschen & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
M. A. Kendall, Chf. Engr., Stephens-Adamson Mfg. Co., Aurora, Ill.
Rudolf Kudlich, Asst. to Chf. Mech. Engr., U. S. Bureau of Mines, Washington, D. C.
John J. Moore, Dey & Maddock, 82d and Dennison Sts., Cleveland, Ohio.
F. G. Morris, Genl. Supt. of Coal Mines, Republic Iron & Steel Co., Sayreton, Ala.
G. H. Morse, Genl. Supt., Republic Iron & Steel Co., Oliver Bldg., Pittsburgh, Pa.
H. F. Nash, Vice Pres. & Genl. Mgr. of Sales, Oakdale Coal Co., Gas and Electric Bldg., Denver, Colo.
Warren R. Roberts, Pres., Roberts & Schaefer Co., Wrigley Bldg., Chicago, Ill.
H. D. Smith, Genl. Supt., American Coal Co. of Allegany County, McComas, W. Va.
C. R. Stahl, Asst. to Genl. Mgr., E. E. White Coal Co., Stoteabury, W. Va.
C. Law Watkins, Vice Pres., Pennsylvania Coal & Coke Corpn., Cresson, Pa.
F. W. Whiteside, Chf. Engr., Victor-American Fuel Co., Ernest & Cranmer Bldg., Denver, Colo.

OFFICERS AND COMMITTEES, 1927—(Concluded)

Underground Power Transmission

A. B. Kiser, *Chairman*

W. A. Chandler, Elec. Engr., Hudson Coal Co., Scranton, Pa.
Harvey Conrad, Genl. Mgr., American Coal Mng. Co., Bicknell, Ind.
L. C. Ilsley, U. S. Bureau of Mines, 4800 Forbes St., Pittsburgh, Pa.
R. L. Kingsland, Genl. Supt., Power and Mechanical Dept., Consolidation Coal Co., Fairmont, W. Va.
Carl Lee, Elec. Engr., Peabody Coal Co., 1652 McCormick Bldg., Chicago, Ill.
Wm. Schott, Cons. Engr., Big Creek Coal Co., Chicago, Ill.
Henry M. Warren, Cons. Engr., Glen Alden Coal Co., 300 Jefferson Ave., Scranton, Pa.

Power Equipment

F. L. Stone, *Chairman*

W. C. Adams, Allen & Garcia, Chicago, Ill.
Graham Bright, Cons. Engr., Howard N. Eavenson & Associates, 1302 Union Trust Bldg., Pittsburgh, Pa.
Stephen H. Green, Pacific Coast Coal Co., Seattle, Wash.
O. P. Hood, Chf. Mech. Engr., U. S. Bureau of Mines, Washington, D. C.
J. T. Jennings, Power Engr., Philadelphia & Reading Coal & Iron Co., Pottsville, Pa.
R. L. Kingsland, Consolidation Coal Co., Fairmont, W. Va.
M. D. Kirk, Vesta Coal Co., Jones & Laughlin Bldg., Pittsburgh, Pa.
Chas. Legrand, Cons. Engr., Phelps Dodge Corpn., Douglas, Ariz.
Martin J. Lide, Cons. Engr., Woodward Bldg., Birmingham, Ala.
J. A. Malady, Master Mech. & Elec. Engr., Hillman Coal & Coke Co., 2307 First National Bank Bldg., Pittsburgh, Pa.
A. J. Nicht, Jr., Engr., Hoisting Equipment, Allis-Chalmers Mfg. Co., Milwaukee, Wis.
W. C. Shunk, Stonega Coal & Coke Co., Big Stone Gap, Va.
Geo. S. Thompson, Chf. Elec. & Master Mech., Colorado Fuel & Iron Co., Pueblo, Colo.
C. D. Woodward, Chf. Elec. Engr., Anaconda Copper Mining Co., 514 Hennessy Bldg., Butte, Mont.

Mine Timbering

R. E. Krape, *Chairman*

SUB-COMMITTEE NO. 1—GENERAL MINE TIMBERING, SIMPLIFICATION ON GRADES AND NAMES

D. F. Holtman (*Chairman*), Asst. Director, National Committee on Wood Utilization, Dept. of Commerce, Washington, D. C.
R. L. Adams, Chf. Engr., Old Ben Coal Corp., Christopher, Ill.
R. W. Austin, Austin & Wood, North 3rd St., Clearfield, Pa.
J. R. Crowe, Jr., Pres., Crowe Coal Co., Dwight Bldg., Kansas City, Mo.
R. L. Dyer, Engr., Alabama Fuel & Iron Co., Pioneer Bldg., Birmingham, Ala.
G. A. Knox, Supt., Gunn-Quealy Coal Co., Gunn, Wyo.
Ernest M. Merrill, Pres., Merrill-Ferguson Engineering Co., 506 Kanawha Bank & Trust Bldg., Charleston, W. Va.
Davis Read, Chief Engr., West Kentucky Coal Co., Sturgis, Ky.
George S. Rice, Chf. Mng. Engr., U. S. Bureau of Mines, Washington, D. C.
J. R. Sharp, care of C. F. Kurtz Co., Rock Island, Ill.
Geo. T. Stevens, Chf. Engr., Clinchfield Coal Corpn., Dante, Va.
Frank A. Young, Chief Engr., St. Louis, Rocky Mountain & Pacific Co., Raton, N. M.

SUB-COMMITTEE NO. 2—PRESERVATION OF MINE TIMBERS

Geo. M. Hunt (*Chairman*), In Charge of Wood Preservation Section, Forest Products Laboratory, Madison, Wis.
R. L. Adams, Chf. Engr., Old Ben Coal Corp., Christopher, Ill.
W. L. Affelder, Asst. to Pres., Hillman Coal and Coke Co., 2306 First Natl. Bank Bldg., Pittsburgh, Pa.
R. W. Austin, Austin & Wood, North 3rd St., Clearfield, Pa.
M. E. Haworth, Chief Engr., Hillman Coal & Coke Co., First Natl. Bank Bldg., Pittsburgh, Pa.
M. H. Sellers, Timber Agent, Chicago, Wilmington & Franklin Coal Co., Carbondale, Ill.
D. A. Stout, Chief Engr. of Mines, Fuel Dept., Colorado Fuel & Iron Co., Pueblo, Colo.

SUB-COMMITTEE NO. 3—USE OF CONCRETE IN MINE TIMBERING

Newell G. Alford (*Chairman*), Vice-Pres., Howard N. Eavenson & Associates, 1302 Union Trust Bldg., Pittsburgh, Pa.
R. L. Adams, Chief Engineer, Old Ben Coal Corporation, Christopher, Ill.
Jas. R. Barber, Asst. Engineer, St. Louis, Rocky Mountain & Pacific Co., Raton, New Mexico.
D. W. Blaylock, Chief Engineer, Madison Coal Corporation, Glen Carbon, Ill.
Walter Buss, Chief Engineer, Knox Consolidated Coal Co., Vincennes, Ind.
B. C. Collier, Pres., Cement-Gun Co., Inc., Allentown, Pa.
W. E. Guller, Chief Engr., Donk Bros. Coal & Coke Co., Edwardsville, Ill.
Frank Haas, Cons. Engineer, Consolidation Coal Co., Fairmont, West Va.
Daniel Harrington, U. S. Bureau of Mines, Washington, D. C.
C. T. Hayden, Chief Engineer, Cosgrove-Meehan Coal Corp., Marion, Ill.
Fred J. Hogan, Mining Engineer, Spangler, Pa.
L. W. Householder, Chief Engineer, Rochester & Pittsburgh Coal & Iron Co., Indiana, Pa.
W. R. Peck, Chief Engineer, Black Diamond Collieries Co., Coal Creek, Tenn.
J. C. Quade, Chief Engineer, Saline County Coal Corp., Harrisburg, Ill.
C. E. Swann, Chief Engr., Union Pacific Coal Co., Rock Springs, Wyo.
F. W. Whiteside, Chief Engineer, Victor-American Fuel Co., Denver, Colo.
H. S. Wright, Engineer, Structural Bureau, Portland Cement Ass'n, 33 West Grand Ave., Chicago, Ill.

SUB-COMMITTEE NO. 4—USE OF STRUCTURAL STEEL FOR MINE TIMBERING

J. D. Snyder (*Chairman*), Div. Engr., Consolidation Coal Co., Frostburg, Md.
L. B. Abbott, Chief Engineer, Consolidation Coal Co., Jenkins, Ky.
R. L. Adams, Chf. Engr., Old Ben Coal Corp., Christopher, Ill.
D. W. Blaylock, Mng. Engr., Madison Coal Corpn., Glen Carbon, Ill.
J. M. Clark, Jr., Asst. Engr., E. E. White Coal Co., Mt. Hope, W. Va.
R. V. Clay, Wheeling & Lake Erie Coal Mining Co., Cleveland, Ohio.
N. M. Hench, Carnegie Steel Co., Carnegie Building, Pittsburgh, Pa.
A. W. Hesse, Chf. Coal Mng. Engr., Youngstown Sheet & Tube Co., Nemacolin, Pa.
Robert A. Marble, Carnegie Steel Co., Carnegie Bldg., Pittsburgh, Pa.
Geo. A. Richardson, Mgr., Technical Publicity Dept., Bethlehem Steel Co., Bethlehem, Pa.
J. A. Saxe, Chief Engineer, Bethlehem Mines Corporation, Heilwood, Pa.
Frank A. Young, Chief Engineer, St. Louis, Rocky Mountain & Pacific Co., Raton, N. M.

SUB-COMMITTEE NO. 5—SALVAGE OF MINE TIMBER

George T. Stevens (*Chairman*), Chf. Engr., Clinchfield Coal Corpn., Dante, Va.
R. L. Adams, Chf. Engr., Old Ben Coal Corp., Christopher, Ill.
Frank S. Follansbee, Chief Mining Engineer, Woodward Iron Co., Woodward, Ala.
H. F. McCullough, Engineer in charge of Mechanization of Mines, Consolidation Coal Co., Fairmont, W. Va.

SUB-COMMITTEE NO. 6—REFORESTATION

A. C. Silvius (*Chairman*), Forester, Philadelphia & Reading Coal and Iron Co., Pottsville, Pa.
C. R. Anderson, Professor of Extension Forestry, The Pennsylvania State College, State College, Pa.
M. H. Doolittle, Supt., Carbondale Coal Co., Carbondale, Ohio.
John W. Keller, Chief, State Forest Extension, Harrisburg, Pa.
Edmund Secrest, State Forester, Wooster, Ohio.
J. M. Sloan, Secretary-Treasurer, Anthracite Forest Protective Assn., 431 West Broad St., Hazelton, Pa.
Ralph A. Smith, Secretary-Treasurer, Pennsylvania Forest Products Manufacturers Assn., Tyrone, Pa.
R. D. Tonkin, Forester, Clearfield Bituminous Coal Corpn., Indiana, Pa.
W. D. Tyler, Land Agent, Clinchfield Coal Corporation, Dante, Va.

METAL MINING BRANCH

General Committee

Charles A. Mitke (*Chairman*), Cons. Mng. Engr., Phoenix, Ariz.
Frank Ayer, Mgr., Moctezuma Copper Co., Nacozari, Sonora, Mexico.
Wm. Coniber, Safety Inspector, Cleveland-Cliffs Iron Co., Ishpeming, Mich.
Arthur Crowfoot, Mill Supt., Phelps Dodge Corpn., Morenci, Ariz.
William B. Daly, Genl. Mgr. of Mines, Anaconda Copper Mining Co., 504 Hennessy Bldg., Butte, Mont.
Lucien Eaton, Supt., Ishpeming District, Cleveland-Cliffs Iron Co., Ishpeming, Mich.
H. C. Goodrich, Chf. Engr., Utah Copper Co., Kearns Bldg., Salt Lake City, Utah.
T. O. McGrath, Mgr., Shattuck-Denn Mng. Corp., Bisbee, Ariz.
Dr. Frank H. Probert, Dean, College of Mining, University of California, Berkeley, Calif.
Philip D. Wilson, American Metal Co., Ltd., 61 Broadway, New York City.

Mine Drainage

Wm. H. Gallagher, Jr., *Chairman*

H. T. Abrams, Dept., Mgr. of Air Lift Pumps and "Calyx" Drills, Ingersoll-Rand Co., 11 Broadway, New York City.
G. L. Kollberg, Mgr., Pumping Engine Dept., Allis-Chalmers Mfg. Co., Milwaukee, Wis.
O. D. McClure, Chief Mech. Engr., Cleveland-Cliffs Iron Co., Ishpeming, Mich.
Charles Mendelsohn, Master Mechanic, Old Dominion Company, Globe, Ariz.
W. A. Rankin, Elec. Engr., Copper Range Company, Painesdale, Mich.
W. N. Tanner, Chief Engr., Anaconda Copper Mining Co., 514 Hennessy Bldg., Butte, Mont.
C. D. Woodward, Chief Elec. Engr., Anaconda Copper Mining Co., 514 Hennessy Bldg., Butte, Mont.

Drilling Machines and Drill Steel

Frank Ayer, *Chairman*

SUB-COMMITTEE NO. 1—DRILLING MACHINES

B. F. Tillson (*Chairman*), Asst. Supt., New Jersey Zinc Co., Franklin, N. J.
L. C. Bayles, Designing Engr., Rock Drill Dept., Ingersoll-Rand Co., Phillipsburg, N. J.
Arthur B. Foote, Genl. Mgr., North Star Mines Co., Grass Valley, Calif.
J. A. Fulton, Idaho-Maryland Mines Co., Grass Valley, Calif.
Roy H. Marks, Efficiency Engr., United Verde Extension Mng. Co., Jerome, Ariz.
R. T. Murrill, Efficiency Engr., St. Joseph Lead Co., Rivermines, Mo.
R. A. Scott, Sales Mgr., Denver Rock Drill Mfg. Co., 39th and Williams St., Denver, Colo.
W. C. Scott, Supt., Morenci Branch, Phelps Dodge Corpn., Metcalf, Ariz.
George A. Shaw, Mine Supt., Talache Mines, Inc., Talache, Idaho.
H. T. Walsh, Vice Pres., Sullivan Machinery Co., Peoples Gas Bldg., Chicago, Ill.

SUB-COMMITTEE NO. 2—DRILL STEEL

Norman B. Braly, Genl. Mgr., North Butte Mng. Co., Butte, Mont.
E. G. Deane, Mgr., Superior & Boston Copper Co., Copper Hill, Ariz.
O. J. Egleston, Mgr., U. S. Smelting, Refining & Mining Co., Kennett, Calif.
C. S. Elayer, Cloudcroft, N. Mex.
E. F. Hastings, Salesman, Ingersoll-Rand Co. of Texas, Dominion Hotel, Globe, Ariz.
Chas. S. Hurter, Tech. Representative, E. I. du Pont de Nemours & Co., Inc., 5104 Du Pont Bldg., Wilmington, Del.
Charles B. Officer, Asst. to Pres., Sullivan Machinery Co., 122 So. Mich. Ave., Chicago, Ill.
Henry S. Potter, Managing Director, Henry S. Potter, Ltd., 26 Cullinan Bldg., Johannesburg, South Africa.
Ocha Potter, Supt., Ahmeek-Kearsarge Br., Calumet & Hecla Mng. Co., Ahmeek, Mich.
Chas. A. Smith, Asst. Genl. Mgr., Ray Consolidated Copper Co., Ray, Ariz.
A. S. Uhler, Mgr., Rock Drill Sales, Ingersoll-Rand Co., 11 Broadway, New York City.
M. van Sicklen, Engr., In Charge of Mining Research, U. S. Bureau of Mines, Washington, D. C.
Bruce C. Yates, Supt., Homestake Mining Co., Lead, South Dakota.

SUB-COMMITTEE NO. 3—METHODS OF SHARPENING DRILL STEEL

W. R. Wade (*Chairman*), Cons. Engr., 1230 Geary St., San Francisco, Calif.
George H. Gilman, Pres., Gilman Mfg. Co., E. Boston, Mass.
Chas. E. Lees, Cia Minera Asarco, S. A., Unidad Veta Grande, Apartado Num, 85, Parral, Chih., Mexico.
Frank W. McLean, United Verde Copper Co., Jerome, Ariz.
W. H. Schacht, Genl. Mgr., Copper Range Co., Painesdale, Mich.
H. W. Seamon, Supt., Comstock Merger Mines, Inc., Virginia City, Nev.

Underground Transportation

William B. Daly, *Chairman*

Thos. C. Baker, Genl. Mgr., The Comstock Merger Mines Co., Virginia City, Nev.
George H. Booth, Mech. Engr., Inspiration Cons. Co., Inspiration, Ariz.
R. R. Boyd, 616 Foothill Rd., Beverly Hills, California (C. C. M. Oil Co.)
D. S. Calland, Managing Director, Compania de Real del Monte de Pachuca, Pachuca, Hidalgo, Mexico.
W. R. Crane, Supt., Southern Station, U. S. Bureau of Mines, New Federal Bldg., Birmingham, Ala.
W. Val DeCamp, Genl. Mine Supt., United Verde Copper Co., Jerome, Ariz.
Robert H. Dickson, Mgr., Verde Central Mines, Inc., Jerome, Ariz.
Stanly A. Easton, Mgr., Bunker Hill & Sullivan Mng. & Concentrating Co., Kellogg, Idaho.
H. T. Hamilton, Cons. Mng. Engr., 1408 California Commercial Union Bldg., San Francisco, Calif.
F. H. Hayes, Mine Supt., Copper Queen Branch, Phelps Dodge Corpn., Bisbee, Ariz.
R. E. Howe, Genl. Supt., Cananea Cons. Copper Co., Cananea, Sonora, Mexico.

OFFICERS AND COMMITTEES, 1927—(Continued)

C. A. Lantz, Genl. Mgr., Compania de Santa Gertrudis, S. A., Apartado No. 1, Pachuca, Hidalgo, Mexico.
E. M. Norris, Asst. Genl. Supt. of Mines, Anaconda Copper Mining Co., Butte, Mont.
Thomas K. Scott, Supt., Munro Iron Mining Co., Iron River, Mich.
Andover Syverson, Prescott, Ariz.

Fire-Fighting Equipment

Wm. Conibear, *Chairman*

SUB-COMMITTEE NO. 1—CONTROL OF VENTILATING EQUIPMENT DURING MINE FIRES

Orr Woodburn (*Chairman*), Director, Globe-Miami District, Mine Rescue and First Aid Assn., Globe, Ariz.
Guy J. Johnson, Field Representative, Homestake Mng. Co., Lead, S. Dak.
H. J. Rahilly, Asst. Genl. Supt., Original Stewart, Colorado Mines, Anaconda Copper Mining Co., Butte, Mont.
Albert Tallon, Safety Inspector, The Old Dominion Co., Globe, Ariz.
J. T. Young, Safety Inspector, Arizona Copper Company, Morenci, Ariz.

SUB-COMMITTEE NO. 2—FIRE HOSE

R. H. Seip (*Chairman*), New Jersey Zinc Co., Franklin, N. J.
C. W. Moon, Safety Inspector, Phelps Dodge Corpn., Bisbee, Ariz.

Mining Excavating Equipment—Exclusive of Dredges

H. C. Goodrich, *Chairman*

H. G. S. Anderson, Mng. and Met. Engr., Rolla, Mo.
H. C. Bellinger, Vice Pres., Chile Exploration Co., 25 Broadway, New York City.
Michael Curley, Genl. Supt., New Cornelia Copper Co., Ajo, Ariz.
H. T. Gracely, Adv. Mgr., Marion Steam Shovel Co., Marion, Ohio.
C. B. Lakenan, Genl. Mgr., Nevada Cons. Copper Co., McGill, Nev.
W. J. Lester, Pres., Kentucky Washed Coal Co., Greenville, Ky.
C. H. Matthews, Genl. Engineering Dept., Westinghouse, Elec. & Mfg. Co., E. Pittsburgh, Pa.
Geo. Mieyr, Supt., Sacramento Hill, Copper Queen Branch, Phelps Dodge Corpn., Bisbee, Ariz.
G. A. Murfey, Treas. and Chief Engr., The Browning Co., 16226 Waterloo Rd., Cleveland, Ohio.
Henry B. Oatley, Vice Pres., Superheater Co., 17 E. 42nd St., New York City.
Thos. A. Snyder, Bucyrus Co., South Milwaukee, Wis.
Robt. E. Tally, Genl. Mgr., United Verde Copper Co., Jerome, Ariz.
J. C. Wheat, Development Engr., Industrial Works, Bay City, Mich.
Charles S. Whitaker, Vice Pres., Winston Bros. Co., 801 Globe Bldg., Minneapolis, Minn.

Mine Ventilation

Chas. A. Mitke, *Chairman* (*Temporary*)

Robt. N. Bell, Cons. Mng. Engr., Box 1339, Boise, Idaho.
Walter C. Browning, Cons. Engr., 1215 Pacific Mutual Bldg., Los Angeles, Calif.
O. K. Dyer, Mgr., Small Blower Dept., Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Daniel Harrington, U. S. Bureau of Mines, Washington, D. C.
E. T. Lednum, Mgr., E. I. du Pont de Nemours & Co., Inc., 406 Ideal Bldg., Denver, Colo.
C. E. Legrand, Cons. Engr., Phelps Dodge Corpn., Douglas, Ariz.
F. W. Maclennan, Genl. Mgr., Miami Copper Co., Miami, Ariz.
Don M. Rait, Supt. of Mines, Calumet and Arizona Mining Co., Warren, Ariz.
A. S. Richardson, Ventilation Engr., Anaconda Copper Mining Co., Butte, Mont.
Wm. A. Rowe, Chief Engr., American Blower Co., 6004 Russell St., Detroit, Mich.
A. C. Stoddard, Chief Mine Engr., Inspiration Cons. Copper Co., Inspiration, Ariz.
F. L. Stone, Industrial Engineering Dept., General Electric Co., Schenectady, N. Y.
E. B. Williams, Mgr., Mining Dept., B. F. Sturtevant Co., Hyde Park, Boston, Mass.

Mechanical Loading Underground

Lucien Eaton, *Chairman*

SUB-COMMITTEE NO. 1—LOADING MACHINES FOR TUNNELS, LARGE DRIFTS AND STOPES

Douglas C. Corner (*Chairman*), St. Louis Power Shovel Co., 320 Chemical Bldg., St. Louis, Mo.
H. E. Billington, Vice Pres. for Sales, The Thew Shovel Co., Lorain, Ohio.
J. H. Henaley, Mine Supt., Miami Copper Co., Miami, Ariz.
H. DeWitt Smith, New York Trust Co., 160 Broadway, New York City.
H. G. Washburn, Asst. Genl. Mgr., Federal Mng. & Smelting Co., Wallace, Idaho.
William Whaley, Genl. Mgr., Myers-Whaley Co., Knoxville, Tenn.

SUB-COMMITTEE NO. 2—LOADING MACHINES FOR SMALL DRIFTS AND FOR WORK ON SUB-LEVELS

G. R. Jackson (*Chairman*), Supt., Cleveland-Cliffs Iron Co., Negaunee, Mich.
C. L. Berrien, Genl. Supt. of Mines, Anaconda Copper Mining Co., Butte, Mont.
H. H. Talboys, Mgr., Shaveloder Dept., Nordberg Mfg. Co., Milwaukee, Wis.
Chas. E. Van Barneveld, Chatsworth, Calif.

SUB-COMMITTEE NO. 3—SCRAPERS

Lucien Eaton (*Chairman*), Supt., Ishpeming District, Cleveland-Cliffs Iron Co., Ishpeming, Mich.
C. L. Kohlhaas, Denver Rock Drill Co., Duluth, Minn.
Ward Royce, Ingersoll-Rand Co., Duluth, Minn.
E. E. Whiteley, Asst. Mgr., Calumet & Arizona Mining Co., Warren, Ariz.

MINE TIMBERING

Frank H. Probert, *Chairman*

SUB-COMMITTEE NO. 1—PRESERVATION OF MINE TIMBERS

Geo. M. Hunt (*Chairman*), In Charge of Section of Wood Preservation, Forest Products Laboratory, Madison, Wis.
Dr. H. C. Gardiner, in care of Anaconda Copper Mng. Co., Anaconda, Mont.
J. H. Hensley, Miami Copper Co., Miami, Ariz.
Gerald Sherman, Cons. Mng. Engr., Phelps Dodge Corpn., Douglas, Ariz.
J. L. Hyde, Mine Timber Dept., Cleveland-Cliffs Iron Co., Ishpeming, Mich.

SUB-COMMITTEE NO. 2—GUNITE AS A SUBSTITUTE FOR TIMBER, ITS PROPER APPLICATIONS AND ITS LIMITATIONS.

E. M. Norris (*Chairman*), Asst. Genl. Supt. of Mines, Anaconda Copper Mining Co., Butte, Mont.
B. C. Collier, Pres., Cement-Gun Co., Inc., Allentown, Pa.
R. R. Horner, Cons. Engr., U. S. Bureau of Mines, Clarksburg, W. Va.

SUBCOMMITTEE NO. 3—DETERMINATION OF SIZE AND SHAPE OF DRIFTS AND DRIFT TIMBERS FOR VARIOUS PURPOSES, WITH A VIEW TO REDUCING SAME TO CERTAIN STANDARD SIZES AND SHAPES

Dr. F. W. Sperr (*Chairman*), Professor of Civil and Mining Engineering, Michigan College of Mines, 315 Florence St., Houghton, Mich.
C. L. Berrien, Genl. Supt. of Mines, Anaconda Copper Mining Co., Butte, Mont.
Felix McDonald, Mines Supt., Inspiration Cons. Copper Co., Inspiration, Ariz.

SUB-COMMITTEE NO. 4—COOPERATION BETWEEN OPERATORS AND LUMBER DEALERS AND MANUFACTURERS WITH A VIEW TO ASCERTAINING WHETHER FURTHER STANDARDIZATION IN SIZES AND SHAPES OF LUMBER UNDERGROUND WOULD RESULT IN A REDUCTION IN COST TO MINING COMPANIES

Charles F. Willis (*Chairman*), Editor and Publisher, Arizona Mining Journal, Phoenix, Ariz.
W. S. Boyd, Genl. Mgr., Ray Cons. Copper Co., Ray, Ariz.
T. Evans, Genl. Mgr., Cananea Cons. Copper Co., Cananea, Sonora, Mexico.
D. F. Holtman, Asst. Director, National Committee on Wood Utilization, Department of Commerce.
G. R. Jackson, Supt., Negaunee Mine, Cleveland-Cliffs Iron Co., Negaunee, Mich.
W. G. McBride, Genl. Mgr., Old Dominion Co., Globe, Ariz.

Mine Accounting

T. O. McGrath, *Chairman*

L. S. Cates, Vice Pres. and Genl. Mgr., Utah Copper Co., Salt Lake City, Utah.
J. C. Dick, Mng. Engr., 511 Newhouse Bldg., Salt Lake City, Utah.
L. K. Diffenderfer, Secy. and Treas., Vanadium Corporation of America, 120 Broadway, New York City.
H. B. Fernald, Loomis-Suffern & Fernald, 50 Broad St., New York City.
H. H. Miller, General Auditor, Hercules Mining Company, Wallace, Idaho.
H. L. Norton, 27 Pearl St., Medford, Mass.
Harry Vivian, Chief Engr., Calumet & Hecla Cons. Copper Co., Calumet, Mich.

Milling and Smelting Practices and Equipment

Arthur Crowfoot, *Chairman*

SUB-COMMITTEE NO. 1—MILLING PRACTICES AND EQUIPMENT

Arthur Crowfoot (*Chairman*), Mill Supt., Phelps Dodge Corpn., Morenci, Ariz.
H. G. S. Anderson, Rolla, Mo.
Herman C. Bellinger, Vice Pres. Chile Exploration Co., 25 Broadway, New York City.
Allan J. Clark, Supt. of Mills, Homestake Mining Co., Lead, S. Dak.
G. R. Delamater, Fuel Engr., W. S. Tyler Co., Superior St., Cleveland, Ohio.
W. M. Drury, Genl. Mgr., Mining Dept., American Smelting and Refining Co., El Paso, Tex.
Guy H. Ruggles, Mill Supt., Inspiration Cons. Copper Co., Inspiration, Ariz.
Henry A. Tobelmann, Ohio Copper Co. of Utah, 500 Clift Bldg., Salt Lake City, Utah.
William Young Westerveit, Cons. Mng. Engr., 522 Fifth Ave., New York City.

SUB-COMMITTEE NO. 2—SMELTING PRACTICES AND EQUIPMENT

J. Owen Ambler, Smelter Supt., Phelps Dodge Corpn., Clifton, Ariz.
P. P. Butler, 116 East Second St., Tucson, Ariz.
Harry A. Clark, Genl. Mgr., Calumet & Arizona Mng. Co., Warren, Ariz.
Kuno Doerr, Genl. Mgr., Southwestern Dept., American Smelting & Refining Co., El Paso Tex.
F. L. Flynn, Toltec Club, El Paso, Tex.
Professor Carle R. Hayward, Associate Professor of Metallurgy, Mass. Institute of Technology, Cambridge, Mass.
George W. Prince, Asst. Genl. Mgr., United Verde Extension Mining Co., Clemenceau, Ariz.
Forest Rutherford, Cons., Metallurgical Engr., 50 Broad St., New York City.

Methods of Mine Sampling, Methods of Recording Underground Geological Data, and Methods of Estimation of Ore Reserves For Low Medium and High Grade Ore Bodies

Philip D. Wilson, *Chairman*

Guy Bjorge, Cons. Mng. Engr., 807 Balfour Bldg., San Francisco, Calif.
E. L. Derby, Jr., Chief Geologist, Cleveland-Cliffs Iron Co., Ishpeming, Mich.
M. J. Elsing, Mng. Engr. and Geologist, Warren, Ariz.
Dr. L. C. Graton, Professor of Geology, Harvard University, Cambridge, Mass.
Julius Kruttschnitt, Jr., Mgr., Mining Dept. of the Southwest, American Smelting and Refining Co., Tucson, Ariz.
F. A. Linforth, Asst. Chf. Geologist and Asst. Chf. Mng. Engr., Anaconda Copper Mining Co., 526 Hennessy Bldg., Butte, Mont.
Albert Mendelsohn, Underground Supt., Champion Copper Co., Painesdale, Mich.
MacHenry Mosier, Mine Supt., Morenci Branch, Phelps Dodge Corpn., Morenci, Ariz.
Louis E. Reber, Jr., Chf. Geologist, United Verde Copper Co., Jerome, Ariz.
T. Skewes Saunders, Cons. Mng. Engr., Ave. Cinco de Mayo 10, Despacho 33, Mexico, D. F.
J. B. Tenney, Bisbee, Ariz.
Robert W. Thomas, Supt. of Mines, Ray Cons. Copper Co., Ray, Ariz.

Joint Publicity Committee

Representing Coal Mining Branch:

Ralph C. Becker, Keystone Consolidated Publishing Co., care McGraw-Hill Publishing Co., 10th Ave. at 36th St., New York City.
C. H. Trik, Sales and Mine Ventilation Engr., Jeffrey Mfg. Co., Columbus, Ohio.

Representing Metal Mining Branch:

T. O. McGrath, Mgr., Shattuck-Denn Mng. Corpn., Bisbee, Ariz.
Charles F. Willis, Editor and Publisher, Arizona Mining Journal, Phoenix, Ariz.

COMMITTEES

COOPERATION

AMERICAN MINING CONGRESS AND AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS

A. M. C.

A. Cressy Morrison, 30 E. 42nd St., New York City.
J. E. Spurr, Hill Bldg., New York City.
W. R. Ingalls, 115 Broadway, New York City.
J. R. Finlay, 170 Broadway, New York City.

A. I. M. & M. E.

E. P. Mathewson, 42 Broadway, New York City.
W. L. Saunders, 11 Broadway, New York City.
Walter Douglas, 99 John St., New York City.
Benjamin B. Thayer, 25 Broadway, New York City.
Samuel Taylor, Second National Bank Bldg., Pittsburgh, Pa.

ALASKAN AFFAIRS

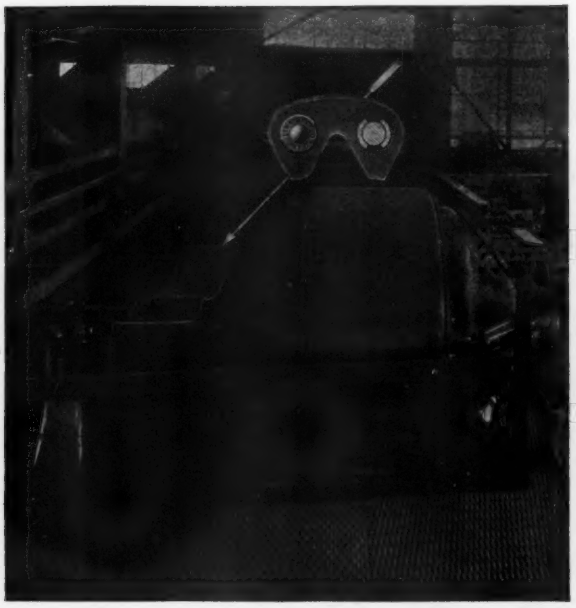
John A. Davis, U. S. Bureau of Mines, Washington, D. C.
Falcon Joslin, 2203 L. C. Smith Bldg., Seattle, Wash.
Bart L. Thane, 408 Crocker Bldg., San Francisco, Calif.

MINING IN FOREIGN COUNTRIES

J. E. Spurr, *Chairman*, Hill Bldg., New York City.
Van H. Manning, 15 West 44th St., New York City.
E. L. Doheny, 120 Broadway, New York City.
W. J. Loring, Merchants National Bank Bldg., Los Angeles, Calif.
Matthew C. Fleming, New York City.
H. Foster Bain, 29 W. 39th St., New York City.

INDEX TO ADVERTISERS

For Complete Preparation,
of Coal at

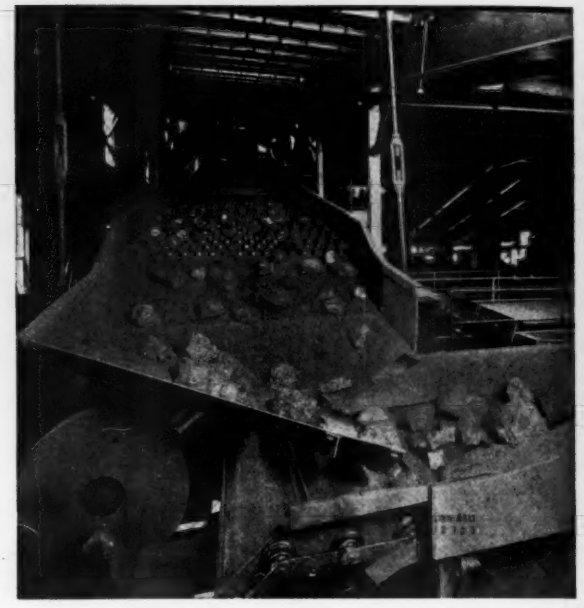


The popularity of Link-Belt Silent Chain Drive for use at the mine is increasing constantly. It is excellent for mine fans, belt conveyors, shaker screens, pumps, compressors, in fact wherever there is a connection between motor and machinery. Send for Silent Chain Data Book No. 125.

It is important to handle your premium sizes carefully after picking and rescreening have rid them of impurities. Link-Belt Loading Booms fulfill this requirement to perfection. They gently and carefully lower the sized coal into the railroad car. We build several types, for loading to both box and gondola cars. Let us help you make the right installation to fit your conditions.

WE manufacture completely in our own plants, every type of coal handling equipment that has stood the test of efficient, practical operation, and that has received the approval of the mining industry generally.

From this advantageous position, the designs of Link-Belt engineers are made without prejudice as to the type of equipment, and with the sole thought of supplying our customers with what our accumulated experience



There is an art in the designing of shaking screens to prepare your coal properly with the least breakage, that is only acquired by years of experience. Our engineers have accumulated a vast fund of knowledge and experience in every phase of coal preparation. They are equipped to give competent, reliable advice regarding the type of screens best suited to your particular coal, and to the requirements of your market.

Complete Coal Tipple

LINK-BELT

Coal Tipples
Coal Washeries
Loading Booms
Picking Tables
Screens
Retarding Conveyors
Car Dumps, Car Hauls
Crushers
Silent Chain Drives
Roller Chain Drives

LINK-
Coal Minin

Handling and Storage at the Mine

indicates will best and most economically meet their requirements.

Those who buy from Link-Belt have the further advantage of being close to a Link-Belt office, in charge of a competent engineer, who keeps in touch with the Link-Belt installations in his territory.

If you do not have a copy of our new book, "Handling and Preparing Coal at the Mine," ask our nearest office to send you Book No. 555.

In certain fields a power-driven Link-Belt Rotary Dump is a profitable investment. By reducing breakage to the very minimum, it insures the maximum sizes in the various grades, increasing the percentages of lump, egg and nut. Rotary dump installations minimize the wear and tear on cars and tipple structures, automatically lowering the repair expense. They also make practical the use of solid box type cars.

It may be possible to reduce your man-power in car haulage by using Link-Belt mine car feeders. Car haul chains are made in many types—a Link-Belt engineer will be glad to go over your problem with you and suggest the right one for your use.

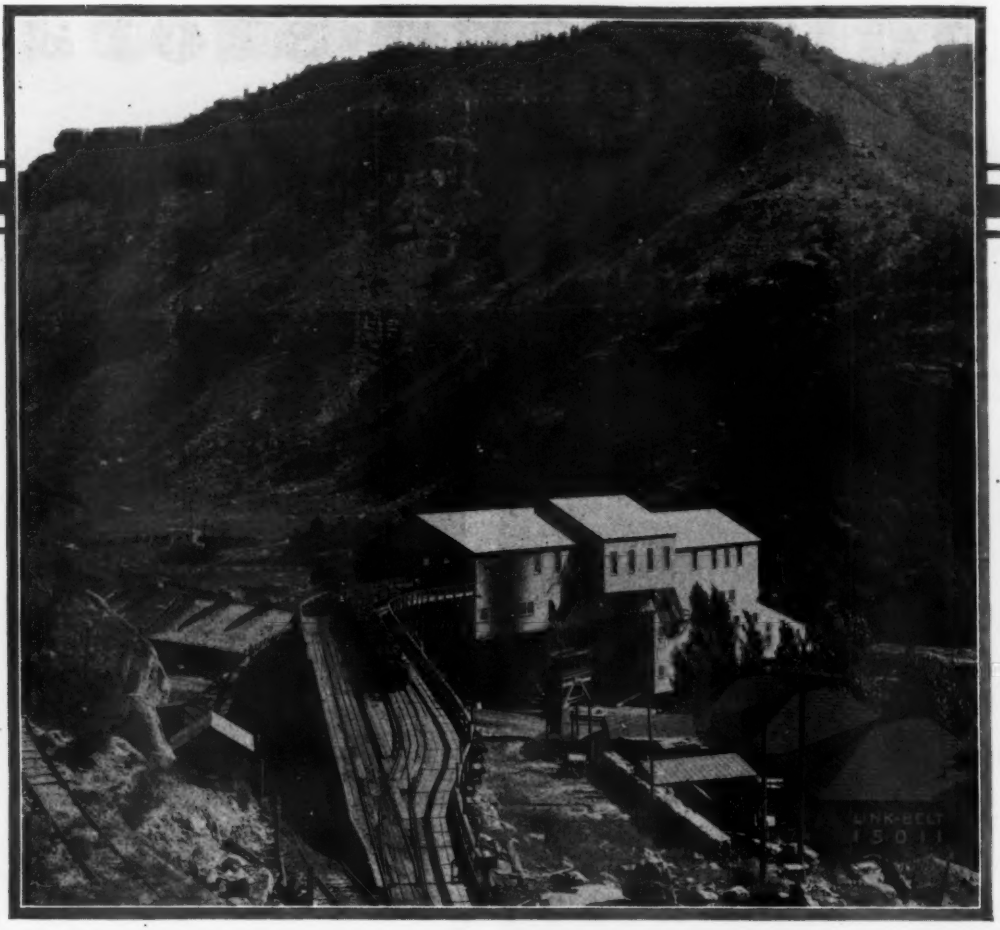
The experience of Link-Belt engineers in the dry cleaning of coal extends back to 1902, when we built the first successful plant for the dry mechanical separation of free impurities from coal. Since that time we have built a large number of these plants, the largest of which are the four which we constructed for the Old Ben Coal Corporation in Southern Illinois. The owners of our latest installation pronounce it an unqualified success. Ask our nearest engineer to explain our method. The illustration below is of the dry cleaning plant of the Spring Canyon Coal Co., Spring Canyon, Utah.

Tipples and Washeries

PRODUCTS

Locomotive Cranes
Crawler Cranes
Portable Loaders
Vibrating Screens
Face Conveyors
Spiral Separators
Manierre Box Car Loaders
Conveyors of every type
Chains, Wheels, Buckets

LINK-BELT Machinery



The Most Modern Tipple in the West

This is the trade-mark under which Spring Canyon's carefully prepared coal is sold.

THE Spring Canyon Coal Company's new Link-Belt tipple is, we believe, the most modern in the West. It is located at Spring Canyon, Utah.

The design incorporates a power-driven rotary dump, shaking screens, picking tables and loading booms for the premium sizes, and spiralizers for the dry cleaning of the small sizes.

Designed in accordance with the Link-Belt policy of furnishing a plant which will prepare coal to meet successfully selling competition.

Ask for a copy of our new Book No. 555

LINK-BELT COMPANY

Leading manufacturers of Elevating, Conveying, and Power Transmission Chains and Machinery.

PHILADELPHIA, 2045 Hunting Park Ave.
Pittsburgh ..... 335 Fifth Ave.
St. Louis ..... 3638 Olive St.

CHICAGO, 300 W. Pershing Road
Wilkes-Barre ....826 2nd National Bank Bldg.
Huntington, W. Va. ..Robson-Prichard Bldg.

INDIANAPOLIS, 200 S. Belmont Ave.
Denver ..... 520 Boston Bldg.
Birmingham, Ala.....720 Brown-Marx Bldg.

LINK-BELT

Here's What One Company Gets

with

42 Slow Speed

Goodman

Gathering Locomotives

6-Ton Slow Speed Gatherer Climbing 14% Grade With Three Loads at Stanaford (W. Va.) Mine of Elkhorn Piney Coal Mining Co.

1. *Increased Tonnage—*

   Because of the more positive action in every locomotive movement in the gathering work; and—

   Because of reduced loss of time from derailments, breakdowns, wheel slippage, maneuvering over room tracks, etc.

2. *Lower Maintenance Costs—*

   TIRES—Wear less, because of greatly reduced slippage.

   BRAKES—Used less, so shoes last longer.

   CONTROLLER—Less wear and burning of contact tips and fingers, because starting current is cut almost in half and running on points is greatly reduced.

   RHEOSTAT—Used less, because the usual speeds of gathering approximate more closely the full speed of the locomotive with controller wide open. Hence, longer life of grids, due to lower temperatures. Also, smaller grids can be used.

   CABLE — Operates at lower temperature. Can be of smaller size, permitting greater length on the same reel. Less liable to be run over.

3. *Decreased Power Consumption—*

   CURRENT USED—both maximum and average—is only from one-half to two-thirds that required in like service by a "standard speed" locomotive. At one operation of this company a 30 percent increase of output has been effected with only 10 percent increase of power.

4. *Much Less Sand Used—*

   An important item in many situations.

Have You Considered These Savings?

See January "Electrical Mining" for complete write-up of a large Slow-Speed installation. Free upon request.

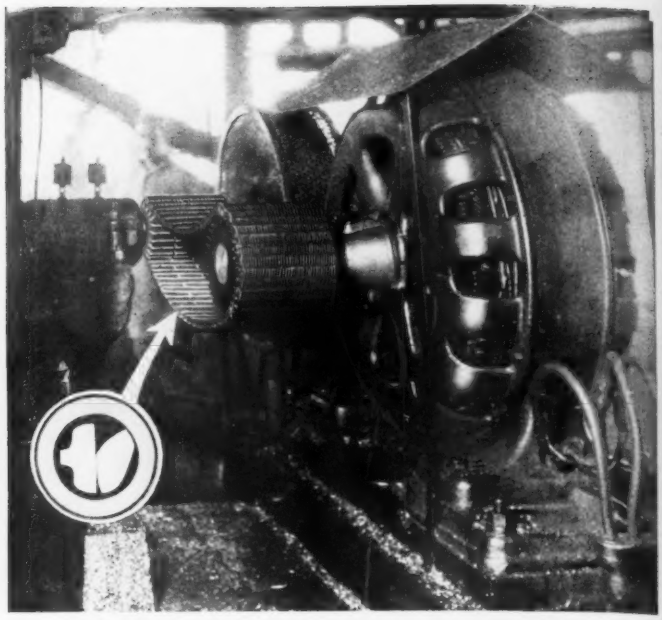
(41)

GOODMAN MANUFACTURING COMPANY

HALSTED ST. at 48TH.
CHICAGO - - - ILL.

Locomotives - Loaders - Coal Cutters

PITTSBURGH - CHARLESTON, W.VA. - HUNTINGTON, W.VA. - CINCINNATI - BIRMINGHAM - ST. LOUIS - DENVER - PRICE, UTAH



Morse Silent Chain Drive from motor to Swinging Hammer Crusher and Pulverizer. Driver, 690 r.p.m., 36-inch centers.

In extremely Severe Service

Here's a drive that has been giving excellent results under extremely severe service conditions. Like over 200 other drives in this plant, it is a Morse Silent Chain Drive. Morse Drives are flexible, absorbing shocks and withstanding strains of sudden overloads. They give positive speed ratios and maintain an efficiency of 98.6 percent throughout their life. Ideal for short centers.

One-tenth or 5,000 H. P., the same dependable results are obtained. Many drives, installed 15 and 20 years ago, are still operating efficiently. Consult the nearest Morse Transmission Engineer in solving your power drive problems.

MORSE CHAIN CO., Ithaca, N. Y., U. S. A.

Morse Engineers are always available at:

ATLANTA, GA.....702 Candler Bldg.
Earl F. Scott & Co.
BALTIMORE, MD...1002 Lexington Bldg.
BIRMINGHAM, ALA.,
Moore Handley Hdwe. Co.
BOSTON, MASS.....141 Milk St.
BUFFALO, N. Y.....Ellicott Square Bldg.
CHARLOTTE, N. C.,
404 Commercial Bank Bldg.
CHICAGO, ILL.....112 W. Adams St.
CLEVELAND, OHIO..421 Engineers Bldg.
DENVER, COLO.....211 Ideal Bldg.
DETROIT, MICH.....7601 Central Ave.
LOUISVILLE, KY.....516 W. Main St.
E. D. Morton Co.
MINNEAPOLIS, MINN.....413 Third St.
Strong-Scott Mfg. Co.
NEW ORLEANS, LA.,
Queen and Crescent Bldg., 334 Camp St.
A. M. Lockett & Co., Ltd.
NEW YORK, N. Y.....50 Church St.
OMAHA, NEB.....727 W. O. W. Bldg.
D. H. Braymer Equipt. Co.
PHILADELPHIA, PA.,
803 Peoples Bank Bldg.
PITTSBURGH, PA.....Westinghouse Bldg.
SAN FRANCISCO, CALIF., Monadnock Bldg.
ST. LOUIS, MO.,
2137 Railway Exchange Bldg.
TORONTO, 2 ONT., CAN..50 Front St., E.
Strong-Scott Mfg. Co.
WINNIPEG, MAN., CAN.....Dufferin St.
Strong-Scott Mfg. Co.

1539

MORSE SILENT CHAIN DRIVES

THE MORSE "ROCKER JOINT"